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# ***JPRS Report***

# **Nuclear Developments**

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# Nuclear Developments

JPRS-TND-88-012

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## Commons Holds Hearings on Nuclear-Powered Submarines

### Veterans' Group Opposition

51200030 Toronto *THE GLOBE AND MAIL* in  
English 4 May 88 p A10

[Article by Paul Koring with Canadian Press]

[Excerpt] Ottawa—A fleet of nuclear-powered, hunter-killer submarines would draw Canada into a destabilizing, first-strike war strategy, a group of veterans opposed to the most expensive arms purchase in Canadian history said yesterday.

The Veterans Against Nuclear Arms told the House of Commons committee on defence that "acquiring nuclear-powered submarines will draw Canada into a strategy which makes a first nuclear strike the preferred option in certain circumstances."

The group based its argument on the contention that the first-strike option figures increasingly in U.S. strategic planning.

The 10 or 12 hunter-killer submarines that the federal Government is proposing to buy from either Britain or France would have to be operationally integrated with the undersea fleets of other North Atlantic Treaty Organization navies, the veterans argued.

The length of Canada's coastline and the key Arctic gateways for Soviet submarines make joint operations a necessity, the group said in a written submission presented by Captain Raymond Creey, a retired Royal Canadian navy aviator and destroyer captain.

The veterans' group also lampooned the suggestion that a fleet of nuclear-powered submarines will allow Canada to assert its sovereignty in disputed Arctic waters. Washington doesn't accept Canadian claims that the Northwest Passage is an internal and not an international strait.

"Canadian submarines are not going to be wheeling around like under-ice police cars picking up vagrants," the group said.

It also argued that communicating with submerged submarines requires special low-frequency radio networks that would be uneconomic to duplicate for such a small fleet.

"It's a delusion to think that any affordable (Canadian) force of defensive vessels, submarines included, can be sufficient in number to search out all missile-firing submarines that may be in the vast Canadian areas... There is no point in the navy suggesting it can protect the country. It cannot," Capt Creey said.

The group argued, "Other than to maintain a threatening presence, the submarine is limited to locating, shadowing and destroying. The game is not worth the risk, the possibility and consequence of error being too high; coercion under the Arctic ice must be through diplomatic channels."

### York University Center Support

51200030 Toronto *THE GLOBE AND MAIL* in  
English 6 May 88 p A13

[Article by Paul Koring]

[Excerpts] Ottawa—A fleet of nuclear-powered, hunter-killer submarines would free Canada to pursue a naval strategy independent of the United States or North Atlantic Treaty organization, Robert Byers, of York University's Centre for International and Strategic Studies, said yesterday.

In testimony to the Commons standing committee on defence, Mr Byers said Canada needs to develop a maritime strategy "capable of operating independently in a high-threat maritime environment."

Mr Byers criticized last year's defence white paper, the centre-piece of which was the purchase of a fleet of nuclear-powered submarines, for its assumption that "Canada's long-term maritime interests will remain compatible with those of NATO."

But he supported the proposed acquisition of the fleet of 10 or 12 submarines, priced at \$8-billion, on the grounds that they offered Canada a powerful and independent capacity to project sea power and ensure Canadian sovereignty.

"It would be imprudent to acquire naval assets on the assumption of long-term military interdependence with either American or NATO maritime forces," said Mr Byers.

Although he said continued cooperation with the allies was important, he stressed the value of independent operation.

After his testimony, Mr Byers added that he believed Canada also should develop an independent communications network for the fleet. Extremely low-frequency radio communications are required to reach submerged submarines, and Mr Byers said his information was that the cost of such a network was not included in the Government's estimates for the submarine program.

The committee also received a surprise submission, yet to be made public, from a Canadian firm, ECS Power Systems of Ottawa, which is developing a design for a low-powered reactor that can be inserted into conventional diesel-electric submarines to recharge their batteries. The system is designed to give conventional submarines the extended underwater, and under-ice, capability

for which the Government chose nuclear-powered submarines to assert Canadian sovereignty claims in the Arctic. The new ECS Power Systems submission claims an improved version of its system, currently being tested, overcomes the extremely low power output that initially would have restricted submarines to very low speeds.

However, the Government already has narrowed the field to either the British Trafalgar or French Rubis/Amethyste submarines and is expected to select one before summer. Defence sources said the ECS submission is extremely unlikely to change that.

The Canadian Maritime Industries Association, representing Canada's 20 major shipyards and more than 80 other companies, pressed the committee to recommend that all of the submarines be constructed in Canada. Both Britain's Vickers Shipbuilding and Engineering Ltd. and SNA Canada Inc., the Canadian unit of the French builders, have indicated that the first one or two submarines should be built in Europe to keep costs down and allow for delivery by 1995.

James Clarke, president of the association, told the committee that Canadian shipyards could deliver the first vessel by the end of 1996.

#### **Disarmament Center Opposition**

51200030 Toronto *THE GLOBE AND MAIL* in  
English 11 May 88 p A4

[Article by Paul Koring]

[Text] Ottawa—Canadians are naive if they assume a multi-billion-dollar fleet of nuclear-powered submarines will be able to enforce Ottawa's disputed claim to Arctic waters, the House of Commons defence committee was told yesterday.

"It is a naive assumption that Canadian submarines could compel the U.S. Navy to respect Canada's Arctic claim," John Lamb, a director of the Canadian Centre for Arms Control and Disarmament, said.

Although the federal Government's plan to purchase 10 or 12 nuclear-powered subs from either Britain or France would give Canada's navy its first-ever capability to patrol beneath the Arctic ice, the privately financed centre suggested that "for political reasons," Ottawa would still be constrained from challenging "American incursions."

Washington refuses to accept Canada's contention that the Northwest Passage is a territorial, rather than international, strait. Defence Minister Perrin Beatty has argued that the under-ice capability of nuclear-powered submarines would allow Canada to assert its sovereignty—which is disputed only by the United States—in the Arctic.

Senior Canadian military officials claim the U.S. Navy already informs Ottawa when its submarines transit Canadian-claimed waters. However, they also acknowledge that Canada possesses no independent means of checking.

Mr Lamb suggested that Canadian submarines operating in the same area would necessitate fuller disclosure from the U.S. Navy. However, that enforced cooperation, "rather than contributing to Canadian independence...could result in closer and closer Canadian integration, as a junior partner, in U.S. naval operations in the North," he said.

The centre also heaped scorn on the notion that 10 or 12 nuclear submarines would actually provide any real presence in the Arctic. "If, as seems certain, only one nuclear submarine would routinely be in the Arctic at any given time, (the fleet) would provide Canada with an extremely marginal deterrent."

The defence white paper, published last year, envisions submarines giving Canada a three-ocean operating capability. Even when all of the vessels are delivered—some time in the next century—usual nuclear-powered submarine operating patterns will mean that one third of them will be in port or refit, one third in transit and therefore only three or four boats on station to be spread among Canadian sectors in the Arctic, Atlantic and Pacific Oceans.

The centre's submission also claimed that the Government had fudged cost and nuclear non-proliferation issues raised by the hunter-killer submarine fleet.

"It is time to take off the rose-tinted glasses and take a long, hard, look at what these subs are really going to cost Canadians, whether they are the best use for our limited defence dollars and whether a program whose sustainability must be questioned should be launched at all," Mr Lamb said.

The Government plans to select either the British Trafalgar or French Rubis/Amethyste submarines before summer. Government claims that the program will cost \$8-billion had drawn widespread skepticism from naval experts outside Canada.

The centre also said that current proposals to enter into bilateral agreements with either France or Britain to safeguard the nuclear-weapons grades of fissionable material which will result from the submarine reactors are inadequate. Although Canada has an enviable record of subscribing to international nuclear safeguards, the centre said bilateral arrangements will "devalue Canada's own credibility as an active and respected proponent of the Nuclear Non-Proliferation Treaty."

"One only need think of India's recent leasing of a nuclear submarine from the Soviet Union," Mr Lamb said. Before the nuclear-submarine program was

launched, "Canada would have undoubtedly have had some strong words to say to Moscow and New Delhi about this. Today we'd be laughed out of the room."

/9604

### **MP Asks IAEA To Study Safety of Fermi II Plant**

51200027 Windsor *THE SATURDAY WINDSOR STAR* in English 23 May 88 p A5

[Text] Ottawa—MP Herb Gray (L-Windsor West) is asking an affiliate of the UN to investigate the safety of the Fermi II nuclear plant.

The move comes after Secretary of State for External Affairs Joe Clark rejected the Liberal House leader's request for a binational review of the Monroe, Mich., plant.

In a letter to the International Atomic Energy Agency (IAEA), Gray has asked for a study of the plant's operation and a report on its findings to U.S. and Canadian governments.

The IAEA, based in Vienna, Austria, was established in 1957 with the goal of increasing the contribution of atomic energy to peace, health and prosperity throughout the world.

The autonomous body, which reports to the UN General Assembly, has operational safety review teams which do evaluations of the overall safety of nuclear plants.

Canada and the U.S. are among the 112 members of the IAEA. Gray has asked Clark and U.S. Ambassador Thomas Niles to support his request that the body review Fermi II.

He said it is unclear whether both countries have to ask for such a review before the IAEA can become involved.

Fermi II's troubled history has aroused concerns that an accident at the plant could jeopardize the lives of Essex County residents.

Gray said he will continue to push for a binational review of the plant by the International Joint Commission, even if his request to the IAEA is accepted.

07310

### **Ontario Asks Ottawa To Examine Fermi II Plant Safety**

51200031 Windsor *THE WINDSOR STAR* in English 2 May 88 p A3

[Text] Ottawa—Ontario Solicitor General Joan Smith has asked the federal government to examine the safety of the Fermi II nuclear plant and the adequacy of the U.S. regulatory system that allowed it to operate at full power.

Smith previously downplayed concerns about Fermi's safety, and opponents of the Monroe, Mich., plant regard her latest move as a minor victory.

"It's one more step ahead in the fight," said MP Steven Langdon (Essex-Windsor, NDP).

In a letter to Energy Minister Marcel Masse, Smith said residents of Essex County are concerned that the nearby plant suffers from design weaknesses and construction defects. Problems which beset the plant during its start-up phase have raised questions about the U.S. Nuclear Regulatory Commission's decision to allow it to operate at full power, the letter adds.

Such concerns should be "examined by appropriate federal agencies and, if warranted, necessary action taken," the letter concludes.

In a second letter to Lynwood Martin, chairman of Essex County Citizens Against Fermi II (ECCAF), Smith says she will monitor the Fermi situation closely.

Smith's department is responsible for emergency procedures in Essex County in the event of an accident at the plant. Her latest actions follow a meeting she had several weeks ago with ECCAF.

In her letter to Masse, Smith says the questions raised about Fermi lie within federal jurisdiction.

Federal Environment Minister Tom McMillan has expressed concerns about Fermi's safety, but Ottawa has not yet intervened.

Last month External Affairs Minister Joe Clark rejected requests for a binational review of the plant.

The Canadian Atomic Energy Control Board (AECB) has found no reason to question the plant's safety or the effectiveness of U.S. nuclear regulators.

/9604

**Study on Safety of Ontario Nuclear Power Plants Released**

51200026 *Toronto THE GLOBE AND MAIL in English* 19 Apr 88 p A4

[Article by Linda McQuaig]

[Text] A Chernobyl-style nuclear accident is impossible in Ontario, but other types of serious nuclear accidents could happen here, according to a Government-commissioned study on the safety of nuclear power plants.

The study, by University of Toronto geographer Kenneth Hare, harshly criticizes the provincial Government for not implementing a plan to deal with such an emergency.

"It is urgently necessary that a formal nuclear emergency planning branch be created within the Ministry of the Solicitor-General, and all the preparedness provisions of the plan be affected," Mr Hare wrote in his report.

"At present," he noted, "Ontario is not ready for a severe accident."

Mr Hare said that although a formal Nuclear Emergency Plan was published in 1986, it has not been implemented.

At a news conference yesterday following the release of the report, Mr Hare said he believes the Ontario Government should implement the 1986 plan immediately.

"It is absolutely absurd that this hasn't been done," he said.

The report also calls for an overhaul of Ontario Hydro's operational safety system.

Mr Hare said that the organizational structure of Hydro's nuclear program appeared to be "excessively complex, with some ambiguities as regards responsibilities.

"There is confusion in settling the status of temporary operating instructions at the stations," the report said.

The one-man commission was established by the Liberal Government in December, 1986, following the Soviet Union's Chernobyl nuclear disaster. That accident killed 31 people and spread large volumes of radioactive materials into the environment.

Mr Hare told reporters that the circumstances that caused Chernobyl could not happen at an Ontario power plant, in part because Hydro's CANDU reactors are of a better design and in part because human error would be less likely.

"I just cannot imagine Ontario Hydro executives behaving like that," Mr Hare said, referring to what he said verged on "the human folly" involved at Chernobyl.

Although he ruled out a Chernobyl-type accident, Mr Hare said "some other types of serious accident may occur." Serious nuclear accidents affecting the public could occur, although he said that such serious accidents were "exceedingly unlikely."

The geographer also said that Hydro's nuclear-power workers do not appear to run a greater risk than the general public of dying from cancer.

In fact, cancer mortality among the Hydro radiation workers is only two-thirds that of the general public, the report said.

However, Mr Hare cautioned that it is too early to see the long-term effects of latent cancers.

In the report, he called for more study of a possible increase in lymphoid leukemia in people under 25 years of age living near nuclear installations.

Studies in England have suggested there may be such a link, Mr Hare noted, but there have been no comparable studies in Canada.

The report, called the Safety of Ontario's Nuclear Power Reactors, said that there was no evidence that the normal operation of Hydro's reactors has caused, or will cause, harmful effects to either the workforce or the public.

"But vigilance is required," the report concludes.

In another section, the report calls for changes in the relationship between Ontario Hydro and the Atomic Energy Control Board, the regulatory agency that sets safety conditions for the public and nuclear workers.

Mr Hare called for a more formal relationship between Hydro and the regulatory body and clearer documentation of all regulatory decisions.

The report said that "the basis of decisions taken by the board is not always clear. A more explicit procedure is needed for full public accountability."

Mr Hare called for an increase in the regulatory body's membership, to include appointments of experts in socio-economic and environmental areas.

The report said that the most serious problems at Hydro power reactors to date have involved pressure tubes in which fuel is located.

Leaks from these tubes have been detected 23 times, and a pressure tube ruptured suddenly at the Pickering A reactor in August, 1983.

**Ontario Hydro Directors Grappling With Tritium Sales Issue**

51200033 Windsor *THE WINDSOR STAR* in English  
12 May 88 p D13

[Text] Toronto (CP)—Within a few weeks, Ontario Hydro will be producing a radioactive byproduct that is a thousand times more valuable than gold.

But even though the substance—tritium—could fetch the utility nearly \$30 million a year in new revenue and spin off new-wave technology, the directors of the provincial Crown corporation are concerned about the political fallout of entering into these kinds of deals.

Tritium is a byproduct of Candu reactors used by Ontario Hydro and sells on the industrial and pharmaceutical research markets for \$15,000 a gram. It is also used in the production of hydrogen bombs.

As far as radioactive isotopes are concerned, tritium is a relatively benign substance. If ingested, a very small quantity can be fatal. But its rays do not penetrate the skin as other radioactive particles do and its main attribute is that it glows in the dark, unstintingly, for at least 20 years.

This means it is an increasingly attractive commodity for illuminating watches, exit signs, remote runways and airplane corridors and for a variety of medical research, including AIDS treatment, where it is used as an internal tracer to track the effect of the disease in the body.

Ontario Hydro is expected to begin production of marketable tritium later this month at its new \$124-million tritium extraction facility at nearby Darlington. It will become by far the largest of only two non-military sources of tritium in the world.

But Hydro's board of directors has been grappling with the issue of selling tritium for several months and has still not come to a decision. One senior executive says the big concern is what this kind of business dealing will do to Hydro's image and that "is a big offset."

Donald Anderson, director of Hydro's marketing arm of its technology and isotope sales, says he hopes there might be a board decision by the end of this year but the matter is fraught with political ramifications.

Anderson's group has identified at least nine major industrial and research users of the product and say that within 5 years they expect to be able to sell Hydro's entire annual production, about 2.5 kg or \$30-million worth.

So far, only two of the potential takers are Canadian companies, small lighting manufacturers in Bedford, N.S., and Peterborough, Ont., that supply remote airfields and are eyeing the new DEW-line contracts in the Arctic.

Anderson says, however, his group has been approached by other, more innovative types, including a cellular phone company that wants low-maintenance lighting for phone booths on remote stretches of highway.

Hydro's hesitation to give the go-ahead may just be an example of corporate caginess. More than half the projected sales of Hydro's tritium—or about \$300-million worth over the next 15 years—would come by supplying a prestigious international project on new fusion technology that the federal government and Hydro have already committed themselves to supporting in various ways.

An outgrowth of a superpower summit in 1985 between U.S. President Ronald Reagan and Soviet leader Mikhail Gorbachev, the multi-billion-dollar research project begins this month in West Germany. It involves scientists from the United States, the Soviet Union, Japan, the European Community and now Canada as a late joiner and part of the European contingent.

The community has already requested Ontario Hydro tritium for at least the start-up phase of the project, internal Hydro documents show. And the federal government tacitly encouraged that by promulgating export regulations for tritium late last year.

In Ontario, Premier David Peterson's Liberal government has also been politically schizophrenic about tritium sales and fusion research.

/9604

**Ontario Offers Site for International Experimental Reactor**

51200032 Toronto *THE GLOBE AND MAIL* in English 6 May 88 pp B1, B2

[Article by Robert Sheppard]

[Excerpt] The Ontario Government has quietly offered to provide a "host site" for an experimental nuclear reactor that is being developed as part of a superpower agreement by international scientists.

The offer was made in January in a letter from Ontario Premier David Peterson to Prime Minister Brian Mulroney, in which Canada is urged to push for the reactor as a potential boon to the country's technological development. The letter was obtained by *THE GLOBE AND MAIL*.



If Ottawa takes up the challenge, it will place Canada in competition with Finland and West Germany. The two countries have already offered to accommodate the experimental, \$5-billion-plus reactor, which is described as the world's "next major step" in fusion energy development.

If successful, the initiative would almost certainly heighten the politics of nuclear concern in Ontario and perhaps even highlight some of the Peterson Government's inconsistencies on the subject.

Three years ago, Mr Peterson campaigned against completing the last phase of Ontario Hydro's nuclear station at Darlington, only to change his mind once his Liberal Party formed the Government.

Moreover, this fusion project by the superpowers, known as the International Thermonuclear Experimental Reactor, will require an estimated \$300-million worth of tritium fuel, a byproduct of heavy water reactors such as the Candu, which Ontario Hydro is to begin processing shortly at its new Darlington plant.

The European Community, one of four partners in the ITER program, along with the United States, the Soviet Union and Japan, has already asked Ontario Hydro to provide some small amounts of tritium for the initial research stage, which is getting under way in West Germany.

However, the Crown corporation has not yet agreed to the request because, among other things, it is conscious of the local controversy surrounding the new tritium facility and is waiting for approval from the province, according to internal Hydro documents, released under a freedom of information request.

The Peterson letter of 11 January, which was obtained from another source, argues that Canada's involvement in the international fusion program "will establish long-term benefits for our technology development, research engineering and high-tech manufacturing industries."

The Premier is offering Ontario Hydro's Bruce, Lennox and Wesleyville energy centres as possible sites for the experimental reactor and notes that building it would provide an estimated 11,000 jobs during a 10-year construction period and about \$1-billion in federal and provincial tax revenue over the life of the project.

"In addition to providing the site, Canada can make important contributions to this project in research and engineering, tritium fuel handling technology, manufacturing of components and the provision of tritium fuel," Mr Peterson wrote.

Canadian scientists involved in the project have noted as well that the host country is expected to provide an extra 10 percent of the construction cost, which means that a combined federal-provincial share would amount to about \$250-million during the 10-year period.

Mr Peterson is clearly enthusiastic about the possibility of playing host for the ITER project, which contrasts somewhat with his Government's approach to date on financing fusion research projects in Canada.

Ontario halted its contributions to the Canadian Fusion Fuels Technology Project 2 years ago when the first 5-year phase ended.

It subsequently encouraged Ontario Hydro, which manages the project on behalf of itself, Atomic Energy of Canada Ltd. and interested businesses, to approach the Premier's Technology Council for money.

But after 16 months of trying, this has not been forthcoming, despite repeated entreaties that the money is needed and would help lever up the industry research portion, project manager Donald Dautovich said in an interview.

The Canadian fusion group is providing research and manpower for the first stage of the international fusion project that is getting under way in West Germany.

Under an agreement with the European Community, to be signed next month, Canada is providing 10 percent (about \$4-million) of the EC contribution in the design stage of the fusion reactor. China has also been invited to participate.

A decision on who will host the project is not expected until 1991 at the earliest.

/9604

#### **Uranium Producers Concerned at U.S. Duty Threat**

51200028 Vancouver *THE WEEKEND SUN in English* 2 Apr 88 p H5

[Text] Toronto—Canadian uranium producers threatened by the passage of a U.S. law penalizing imports of the metal say the protectionist rumblings are worrying them.

"I guess the Senate's approval is certainly an expression of an attitude that we take seriously," said David Smith of Eldorado Resources Ltd., Canada's second-largest uranium producer.

The U.S. Senate voted Wednesday in favor of legislation imposing a sliding scale of penalty duties during the next 12 years on utilities that use foreign uranium to meet more than 37.5 per cent of their needs.

One senator called the move "a stab in the back of Canada" while another said the decision could create difficulties for the free-trade accord between the two countries.

The trade agreement, which still requires the approval of Parliament and Congress, eliminates all barriers to uranium trade as part of a broader effort to lift tariff and non-tariff trade barriers between the two countries.

Canada annually supplies about one-third of U.S. uranium needs worth an estimated \$200 million to domestic producers.

"We can't really do anything about it," said Don Somers, a vice-president with Canada's largest producer, the Saskatchewan Mining Development Corp.

"We continue to monitor the situation and, if there's an opportunity for us to clarify any misunderstanding, we're prepared to do so."

Until 1980, the U.S. industry was the world's largest, but its production has dropped by as much as two-thirds since then in the face of stiff Canadian competition.

The large Canadian deposits of uranium are of a higher grade than U.S. supplies, which makes Canadian uranium cheaper to produce.

In Washington, meanwhile, Congress decided Thursday to drop from a trade bill a provision that would have required the U.S. to retaliate against trading partners who unfairly block U.S. competition.

The provision would have required the U.S. to retaliate against countries running consistent trade surpluses with the U.S. because of unfair barriers. The president had opposed the provision.

On Friday, the U.S. announced that beginning July 1 it will eliminate duty-free imports on products.

07310

**Activists Protest Eldorado Nuclear Waste Dump**  
*51200029 Windsor THE WINDSOR STAR in English*  
*11 Apr 88 p D7*

[Text] Toronto (CP)—About 100 protesters demonstrated outside Eldorado Resources Ltd.'s nuclear waste dump near Oshawa on Sunday, chaining its gates and threatening further action if it isn't closed.

The group, which included environmental activists, local politicians and residents of the town of Port Granby, gathered outside the Port Granby Waste Management and Water Treatment Facility on the shores of Lake Ontario, about 70 km east of Toronto.

"It is shameful and wrong" that the dump—ordered closed 12 years ago—is still open and leaking poisons into the lake, said John Veldhuis, president of a Port Granby group that organized the protest.

The Atomic Energy Control Board, which ordered the dump closed in 1976 because radioactive substances were leaking into the lake, will meet this month to hear residents' concerns about the dump.

Police watched the protest Sunday, but did not interfere when the demonstrators locked two heavy chains around the main gates leading into the facility.

The dump contains 300,000 cubic meters of contaminated soil dumped during the last 30 years by Eldorado, said Greenpeace spokesman John Willis.

"Four and a half million people drink that water (from Lake Ontario)," said Veldhuis. "They're not going to keel over and die tomorrow, but it's not going to enhance their health either."

Veldhuis said although Eldorado has taken some action to lessen the problem, residents and environmentalists remain concerned.

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## BULGARIA

**Thrust for Safe Development of Nuclear Power**  
51000025b Moscow *EKONOMICHESKOYE*  
*SOTRUDNICHESTVO STRAN-CHLENOV SEV in*  
*Russian No 9, 1987 pp 72-77*

[Article by Ivan Pandev, chairman of the Committee for Peaceful Uses of Atomic Energy of the Council of Ministers of Bulgaria: "For the Safe Development of Nuclear Power in Bulgaria"]

[Text] *The dynamic economic growth of Bulgaria under conditions of a lack of intrinsic power supplies required the resolution of the chief issue of the development of power engineering—the choice of power sources and types of future electric-power plants. As a result of profound study of the problem with the aid of Soviet scientific and planning organizations, the concept of utilizing nuclear sources of electric power was devised. The Bulgarian Communist Party [BCP] Central Committee Plenum held in 1969 on the power equation gave the "green light" to nuclear-power engineering. The high power efficiency of nuclear fuel and the minimal effect of nuclear power plants on the environment and the populace were decisive factors.*

The construction of the first VVER-440 [water-cooled water-moderated power reactor] power unit of the Kozloduy AES [nuclear electric power plant] was begun on the shore of the Danube River in 1970. One pledge of success was the fraternal assistance of the USSR in its planning, construction and equipping. The first power unit went into service on 4 Sep 74 on the 30th anniversary of socialist Bulgaria. A four-unit complex of VVER-440s was completed in 1982. Expansion of the Kozloduy AES is envisaged with the construction of another two VVER-1000 power units. The first "thousander" will go into operation this year. The sixth power unit of the AES will be built in 1989.

The building of a second AES with four VVER-1000 power units, which should enter service in the 1990s, has been begun in the city of Belena on the Danube. With its start-up, the share of electric power obtained from AESs in Bulgaria will be 60 percent of the total. New areas for AES construction in the country's interior with a regard for the development of nuclear-power capacity after the year 2000 are being studied. Preliminary planning research is being conducted on building the first nuclear heating-supply plant for the capital with two AST-500 [USSR standard design] power units.

In accordance with the CEMA member countries' program for the development of nuclear-power engineering to the year 2000, Bulgaria is planning to achieve an overall installed AES electric-power capacity of about 9,000 MW [megawatts].

The Kozloduy AES currently provides 1/3 of the electric-power production of the country. Domestic experience in operating reactors (35 reactor-years) has confirmed the reliability of the VVER-440 power units. The average capacity utilization factor for the four power units is equal to about 80 percent and exceeds the world average.

The proven advantages of nuclear-power engineering in our country brought about the resolution of the 13th BCP Congress for its priority development to the year 2000.

### Legislative Steps

The rapid development of nuclear-power engineering and the widespread application of ionizing radiation in industry, medicine, agriculture and science have brought about the necessity of a series of state measures to achieve high safety in the utilization of nuclear power for peaceful purposes.

In 1985 the National Assembly adopted the Law on the Utilization of Nuclear Power for Peaceful Purposes, which abrogated the Ukaz on State Monitoring of Nuclear Safety (1980) that was in effect at the time.

The law defines the basic principles for the use of nuclear power and regulates the most important issues of management of this activity and its state monitoring, regulates civil responsibility for damage from accidents at nuclear structures, envisages a number of administrative sanctions, etc.

This law expressed the consistent peaceful foreign policy of the country. It is stipulated in Article 1 that "Nuclear power in the People's Republic of Bulgaria is used for peaceful purposes alone." In accordance with the Nuclear Non-Proliferation Treaty that has been signed by 130 states of the world, the use of nuclear power to produce such weapons or other nuclear explosive devices, as well as any means of mass destruction, is strictly forbidden.

The protection of the life and health of people and the environment has fundamental significance in the use of nuclear power in Bulgaria—a principle that is also paramount and high-priority in the resolution of national-economic and other problems. At the same time, the law defines the social and economic policies of our country in this area and the sweeping tasks of monitoring.

The execution of a unified state policy in the use of nuclear power has been charged to a department created especially for this purpose—the Committee on the Use of Nuclear Power for Peaceful Purposes (KIAEMTs) of the Council of Ministers.

It is developing concepts and programs for the long term and coordinating the activity of ministries, departments and organizations in this realm as well as scientific and assimilation activity; defining the requirements for the

safe utilization of nuclear power and monitoring their observance; confirming the procedure for accounting for, storing and shipping nuclear materials; substantiating criteria and requirements for the training, qualifications and capability of key personnel in this sphere; and, coordinating work on monitoring pollution of the environment with radioactive substances.

An all-embracing system of state monitoring that is being implemented by KIAEMTs through the Inspectorate for the Safe Utilization of Nuclear Power, which issues special permission for this activity, has been created to execute the law. Monitoring the observance of the stipulated requirements extends to all organs, organizations and officials.

In view of the great potential danger of the widespread use of nuclear power, the law envisages appropriate sanctions and fines for violations of the requirements, and a special section titled "Crimes in the Use of Nuclear Power for Peaceful Purposes" has been introduced into the Criminal Code.

The committee, taking into account contemporary international norms, works constantly to improve existing standard documents and to develop new ones.

#### Steps To Increase Safety

Improving the safety and reliability of operative AESs and those under construction occupies the center of attention of the government and all ministries and departments that are related to this problem.

The operating part of the Kozloduy AES, consisting of four VVER-440 power units, is built according to plans that reflect safety concepts in accordance with the standards documentation in effect at the time. The earthquake in Branch in 1977 which reached 5-6 in the area had no seismic effect on the first and second power units of the AES. Notwithstanding this, the natural disaster became the grounds for the development of a joint Soviet-Bulgarian plan that envisaged a number of measures to ensure nuclear and radiation safety under conditions of enhanced seismic indicators reaching 7 on the Medvedev-Schopenheuer—Karnik (MSK-64) scale. Special hydraulic shock absorbers were delivered and installed according to plan to reinforce the equipment in the first and second loops along with relief valves for the volumetric compensators, a system of seismic monitoring and protection and seismic-resistant batteries and other equipment and devices. The main circulation pumps will have to be replaced with more reliable ones.

A whole set of operations to raise the reliability, safety and economy of the power units is executed each year in conjunction with the anti-seismic measures. A system for emergency water supply has been put into operation, a reservoir for the long-term storage of spent nuclear fuel is

being built and the reliability of the electric-power system, water-treatment regimen, radiation-dosage monitoring at the AES etc. are being improved.

Along with these national steps, Soviet and Bulgarian collectives have developed additional joint plans that envisage enhancing the safe operation of reactor vessels over a planned work period; tightening the monitoring of the state of the reactor metals and vessels and other equipment and pipelines in the primary loop; and, replacing instruments, equipment and apparatus that has exceeded guaranteed working life, as well as a whole set of organizational measures.

A separate plan concerns the reconstruction of the power units at the Kozloduy AES. A strengthening of the reliability of existing safety systems is being achieved via redundancy in their autonomous equipment, modernizing monitoring and control systems, improving fire safety and raising the reliability of fire-protection systems, better preparing of operating personnel at all levels etc.

The first power unit with a VVER-1000 reactor in the CEMA member countries is being built in Bulgaria. Its technical solutions correspond fully to all currently existing standard technical documentation. The safety systems envisage ensuring the localization of the maximum possible planned accident. Three autonomous systems of each type are envisaged. The power unit is rated for a new seismic area of categorization—7 on the MSK-64 scale—with a probability of once in 10,000 years and 6 once every hundred.

A protective dome of prestressed concrete has been built at this power unit and is intended, aside from the localization of accidents, to protect the reactor and the primary loop from outside influences (aircraft crash etc.). A fundamentally new technology—large-slab assembly—was utilized in its construction.

Particular attention in unit assembly is being devoted to the quality of construction and the installation of equipment as the foundation of operational safety. The unwavering observance of the requirements of planning documentation, standards, construction rules and norms and technical safety conditions is systematically monitored at each stage with the participation of Soviet specialists.

The accidents at the Three Mile Island AES in the United States in 1979 and the Chernobyl AES in 1986 have led to the implementation of a broad range of measures and programs to improve engineering solutions, AES management and the training of operational personnel. The quantity of measures to educate the populace to bring radiation exposure to a minimum in the event of nuclear accidents has been increased.

Despite the fact that radioactive pollution of the environment has never occurred over the whole course of operation of the reactors at the Kozloduy AES, the development of an automated information system for outside dosimetric monitoring (AIS VDK) was begun in 1987. It will constantly monitor the radiation levels around the AES automatically by remote control, simultaneously creating a database. The system is adaptive and the amount of data accumulated depends on the situation.

In the event of a planned or hypothetical accident associated with the discharge of radionuclides into the atmosphere, the AIS VDK will determine the degree of danger to the surrounding population, the time it will take for the radioactive cloud to reach populated points in the area and around the AES and the appropriate steps that must be taken to protect the populace and agriculture. In addition, the system will measure and record meteorological parameters and atmospheric stability.

The AIS VDK will monitor the averting of radioactive discharges and will propose solutions, and in the event of discharges will evaluate the degree of danger and the anticipated increase in radioactive water, soil and food products.

A forecast on the dosage load of AES personnel and the population will be developed using the capabilities described.

Aside from this, the system will provide for:

- automatic diagnostics for the equipment complex;
- visual display of information for making rapid decisions (displays, mimic panels, the printout of accident logs, real-time information);
- with the aid of standard interfaces (input/output), expansion of both the volume and types of measurements and the information-processing equipment.

#### **The International Aspect**

The proposals of the USSR government at a special session of the IAEA [International Atomic Energy Agency] General Conference are an important step in creating an international regimen for the safe development of nuclear power. The ideas implicit in it were discussed, developed and put into practice with the support of the socialist countries and a number of developing and developed capitalist countries within the framework of the IAEA.

A Convention on Real-Time Announcement in the Event of Nuclear Accidents, a Convention on Aid in the Event of Nuclear Accidents or a Radiation Emergency Situation and a Convention on the Physical Protection of Nuclear Materials were prepared, coordinated and

signed. These documents have laid the foundation of an international treaty and legal system for the safe development of nuclear power. All of the conventions were ratified by the State Council of Bulgaria, which designated KIAEMTs as the authorized organ answering for the fulfillment of the obligations for their application.

In fulfilling the resolutions of the special session of the IAEA General Conference, an international group of experts, including representatives of Bulgaria, prepared an expanded program whose aim was the creation of scientifically grounded criteria, approaches and steps to raise nuclear and radiation safety. The program for 1987 includes 79 measures in all realms of the safe utilization of nuclear power. Authorized Bulgarian business and scientific organizations have been acquainted with the program, and they have been offered the selection of what measures a vested interest in participating in. On this basis, KIAEMTs will determine the participation of Bulgarian specialists in the program, as well as the application of the results obtained.

The program will make it possible to make topical nuclear-safety standards and to continue the discussion of their voluntary adoption by the IAEA member countries as compulsory.

The IAEA information system on AES incidents, in which Bulgaria takes an active position, is being reinforced and expanded.

Bulgaria also participates in the IAEA programs on research and analysis associated with safety. Specialists from the corresponding scientific institutes, with the aid of computer programs, are conducting thermohydraulic and thermomechanical analyses of the behavior of nuclear fuel in various accident modes. Computer work is being done for this purpose both in our institutes and at the IAEA computer center. A programming collective of specialists in that realm has been created in accordance with the IAEA program to evaluate reliability and risk. It is researching probable evaluations of AES safety and evaluating the risk of the uses of nuclear power for peaceful purposes.

#### **Collaboration Within the Framework of CEMA**

The international interaction of the fraternal states in the CEMA Standing Commission on Collaboration in the Realm of Using Nuclear Power for Peaceful Purposes plays an important role in reinforcing the regimen of safe development of nuclear power.

A program for the development of a Unified Set of Technical-Standards Documentation on the safety and reliability of nuclear-power engineering is included in the Comprehensive Program for the Scientific and Technical Progress of the CEMA Member Countries [CP

STP] in the third priority area—the rapid development of nuclear-power engineering. KIAEMTs is coordinating the participation of the Bulgarian organizations in this program.

The USSR delegation to the Commission has prepared a proposal on the tasks of collaboration that stem from the new requirements for the safe utilization of nuclear power for peaceful purposes, as well as from the IAEA agreements. These topics were discussed at the Intergovernmental Commission to Coordinate Collaboration in the realm of production and mutual deliveries of AES equipment, which implements the overall coordination of interaction in the third priority area of the CP STP. A number of detailed programs in the development of nuclear-power engineering have been supplemented with safety issues as a result.

An agreement on collaboration has been signed between the USSR State Committee for Safety in the Atomic Power Industry and KIAEMTs. The conclusion of such agreements with authorized organs of the other CEMA member countries lies ahead.

\* \* \*

Society displayed uneasiness with radiation and a desire to evaluate its dangers for the first time after Hiroshima. The accident at Chernobyl reminded us of the terrible forces concealed in the power of the atom. That is why ensuring safety in the peaceful utilization of nuclear power requires broad international collaboration.

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**Kozloduy Unit 5 Goes Into Operation**  
*51000001d Moscow SOTSIALISTICHESKAYA  
INDUSTRIYA in Russian 7 Jan 88 p 3*

[Article by V. Kononenko and V. Matyash, special TASS correspondents for SI: "A 'Millionaire' at the Bend of the Danube"; first paragraph is SOTSIALISTICHESKAYA INDUSTRIYA introduction]

[Text] Out of the shrouds of smoke forming from the direction of the Danube, the main wing of the fifth power unit of the Kozloduy AES suddenly appears as a myriad of lights. On the threshold of the new year, when the first cold weather arrived in Bulgaria, it began to generate current to the country's unified power system. This is the first 1000-megawatt power unit outside the USSR. It is still operating in accordance with a comprehensive testing program, which is being carried out in the spacious unit control room, where two shifts—Bulgarian and Soviet operators—constantly keep immediate track of hundreds of instruments.

The foundation of the Kozloduy AES was laid in 1974-1975, when construction began on its first two power units, and six years later—two more type VVER-440 units. As a result, the plant's power reached 1760 megawatts. Bulgaria, which in 1944 produced only 311 million kW-hrs of electrical power, came close to the mark of 40 billion kW-hrs per year, rising into the ranks of the highly developed countries which have mastered the peaceful atom.

When the new "millionaire" of Kozloduy comes up to the planned power, which is expected by early spring, it will provide about 10 percent of all the electric power generated in the People's Republic of Bulgaria. This is approximately equal to half of the every-day needs of the country's population.

Has a respite arrived for power engineers? We asked this question of Georgiy Dichev, director of the Kozloduy AES.

"We anticipate the possibility of a gradual withdrawal to planned repair and renovation of some low-efficiency capacities which have already been operating for several decades," he said. "According to the plan, the sixth unit of the AES at Kozloduy should be put into operation in 1989, and beginning in 1991, with an interval of two years, four more units of the AES being constructed in Belene are scheduled to be put into operation. By the end of the century, the proportion of AES-generated power should constitute half of its production in the country. It must, however, be noted that increasing the capacities alone will not provide the national economy with power to the proper extent. Control must be exerted over its utilization.

It is now possible to speak of the Bulgarian experience in AES construction and operation. Of what does it consist?

"For us the fifth 'millionaire' power unit is of key importance," says G. Dichev. "Our specialists, over 600 of whom have been trained in the USSR in the last few years, were able to construct and develop it. This unit meets the highest world standard. It has an automated control system, new in principle, which differs favorably from its predecessors in design and has reliable protection. In the course of its construction, however, a few 'bottlenecks' appeared, which are by no means entirely connected with the innovative nature of the plan. For example, the mechanism of equipment delivery has not yet been adjusted. For many months now, we have been waiting for new transducers for the reactor protection control system to arrive from the USSR Ministry of Instrument Making, Automation Equipment and Control Systems. This can have an adverse effect on the schedule for taking the power unit to the planned capacity. The ministry itself, however, decided to replace the existing instruments with new ones. So far there has not been a single meeting of specialists to exchange experience in operating the VVER-1000 units."

It is no secret that after the accident at the Three Mile Island AES (United States) and at the Chernobyl AES, world apprehension about developing nuclear power engineering intensified. What are the views on this among the Bulgarian Atomic Energy directors and how does the population of Kozloduy and Belene react to the appearance of the new power units?

"I remember a statement made by Hans Bleeks, general director of MAGATE [International Atomic Energy Agency], at the European Nuclear Congress in 1986, who said that nuclear power is not a whim that we can dismiss. It is a reality, with which we must live, now and in the future," answered G. Dichev. "If we speak of the danger of AES for the environment and the population, it is much less than a TES, for example, represents. In the 14 years of operation of the nuclear units at Kozloduy, the traces of radioactive products constitute, on the average, from 0.1 to 1.0 of the permissible medical norms. For example, a TES, equal in power to the fifth power unit, emits 17-20-fold more radioactive dust into the atmosphere, since any fuel contains various isotopes. Furthermore, we have no alternative, since the country does not have substantial raw material resources. As far as the mood of the population is concerned, it is better to ask about this at the Kozloduy community people's council," advised G. Dichev.

We stopped in there, and received convincing confirmation of the director's words. They showed us sealed vessels with samples of the ground waters and the Danube waters and samples of plants, fish, meat and milk taken during the two years up to the start of the AES construction. Completely fresh samples are kept alongside. It turned out that there were no differences between them.

All the local inhabitants know of the results of these measurements, and they are not alarmed about the effect of the AES on the environment. At the same time, all the collocutors emphasized the fact that, after the accident at Chernobyl, serious measures had been taken to raise technological and work discipline at the AES, and additional protective measures had been carried out.

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**Kozloduy AES Reports Production Figures**  
51000001c Moscow SOTSIALISTICHESKAYA  
INDUSTRIYA in Russian 29 Jan 88 p 3

[Article: "The AES Gathers Power"]

[Text] Sofia, 28 Jan 88—(TASS)—High technological and labor discipline, optimum operating conditions and the reliable work of the power units—that is what today characterizes the situation at the first Bulgarian nuclear power AES, Kozloduy. Some 1.1 billion kilowatt-hours of electric power were produced for the opening here in

Sofia of the national conference of the Bulgarian Communist Party. Important work cycles were completed in scientific-technical improvement of systems for radiation protection, monitoring and full use of nuclear fuel.

Guarantee tests at the fifth power unit with the planned power of 1000 megawatts—the first "record-breaking worker" outside the USSR—were made successfully. In accordance with their results, the reactor, still operating at half its capacity, will begin to generate 1000 megawatts this spring. Therefore, the nuclear river of the Kozloduy AES, constructed with the technical cooperation of the Soviet Union, will flow into the unified power system of the People's Republic of Bulgaria.

The major power complex in Bulgaria was developed in less than three decades. Now each inhabitant of the NRB has an average of 5,105 kilowatt-hours of electric power a year. With respect to electric power per capita, Bulgaria stands among the ranks of such developed European states as Austria, Belgium, England, France and the FRG.

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## CZECHOSLOVAKIA

**Contribution to Nuclear Power Development**  
51000025a Moscow EKONOMICHESKOYE  
SOTRUDNICHESTVO STRAN-CHLENOV SEV in  
Russian No 9, 1987 pp 15-22

[Article by Czechoslovak Commission on Atomic Energy Chairman Stanislav Havel: "The Development of Nuclear Power: The Contribution of the CSSR"]

[Text] *Intensifying the national economy of the CSSR requires an acceleration of scientific and technical development based on the full inclusion of Czechoslovak organizations in the realization of the Comprehensive Program of Scientific and Technical Progress of the CEMA Member Countries to the Year 2000 (the CP STP), efficient structural changes in production, a rise in the quality of planning and management and the more effective application of their economic tools. The output of a sufficient quantity of power and its economical and rational utilization is one of the most important conditions of the development of the national economy and society overall.*

Nuclear power is the sole realistically accessible source of power able to provide for the further progress of the CSSR and a number of other CEMA member countries along with the incorporation of their scientific and technical achievements. The rapid development of nuclear-power engineering is thus included as the third priority area of the CP STP. It was prepared at the

CEMA Committee on Scientific and Technical Collaboration and at periodic conferences of authorized representatives of the countries, while international collectives of scientists and specialists were convened on individual problems.

The activity of this collective in the third priority area was eased to a certain extent by the fact that it had at its disposal a Scientific and Technical Forecast for the solution of the fuel and power problems of the CEMA member countries to the year 2000 and the longer-term future that had been developed over 1981-84. This was the first program document of CEMA in this realm for the period beginning in 1990 and containing a section devoted to nuclear-power engineering. A Program for the Construction of Nuclear Electric Power Plants and Nuclear Heating Supply Plants in the CEMA Member Countries to the Year 2000 with a regard for the possibility of supplying them with nuclear fuel and the essential equipment was also being created concurrently in the CEMA Committee on Collaboration in the Realm of Planning Activity. It was later approved by the 42nd CEMA Session.

The CP STP is one of the principal long-term policy and economic measures whose implementation will have a decisive influence on the realization of the the overall strategic line of the CEMA member countries—the transition onto the path of intensive development. The CP STP encompasses the whole innovative cycle of science—technology—production—application. It can be accelerated only through the consistent unification of scientific, technical, production and economic collaboration with efficiency in the entire process, including providing for the recoupment of funds allocated in specific phases. The active development of direct ties among interested organizations whose contract and legal basis should lead to flexibility in interaction and an enhancement of the obligatory nature of it is also envisaged.

The lead organization—the organizer and coordinator of the work on a problem—is the chief link in scientific and technical and production cooperation in the course of the fulfillment of the CP STP. It resolves extremely complex and qualitatively new tasks:

- providing technical and economic substantiation for the work and a detailed program of collaboration across the whole innovation cycle;
- establishing direct ties with the crucial executors and co-executors of specific operations;
- developing proposals for employing results based on specialization and production cooperation;
- preparing draft contracts, agreements and the like.

The lead organizations are thus allotted broad rights and should make full use of them under the appropriate conditions.

#### The Policy: Realization of the CP STP

The third priority area contains 17 problems that can be grouped into four sections:

- developing and raising the production efficiency of electric power based on the construction of AESs [nuclear electric power plants] with water-moderated water-cooled power reactors (VVER);
- utilizing nuclear power for heating supply;
- developing equipment for fast-neutron reactors (BNR) and new types of reactor installations for power-process operation (high-temperature reactors) and thermonuclear fusion;
- further enhancing the reliability and safety of nuclear power sources.

Czechoslovak organizations are taking part in solving all of these problems. Their vested interest in specific subtopics stems from national-economic requirements, the capabilities of the scientific research base and the efficiency of participation in international collaboration. Detailed programs were signed in 1986 and 1987.

On the problem of **"Raising the Utilization Efficiency of Nuclear Fuel,"** Czechoslovak organizations will take part in realizing the four-year fuel program for the VVER-440, the achievement of a high degree of fuel burn-up and the utilization of all of the possibilities of boosting the capacity of these reactors, as well as the incorporation of a three-year fuel operating period for the VVER-1000, the substantiation of possibilities for power shunting and a whole set of calculations in experiments in physics and thermal physics, including AES safety.

Some of this work will be done on Czechoslovak experimental equipment—a zero-power light-water reactor (LR-0) at the Nuclear Research Institute (NRI) in the city of Ržezh.

The CSSR will participate in testing and incorporating improved fuel-element assemblies (TVS) for the VVER-440 and VVER-1000 reactors, creating sectional TVSs and inspection jigs and analyzing the possibilities for introducing four- and five-year operating periods for the fuel in the VVER-440 and VVER-1000 reactors at AESs.

The Scientific Research Institute for Nuclear Electric Power Plants (NII AES) will execute the functions of coordinator in resolving this problem from the CSSR.



The CSSR has a particular vested interest in implementing the problem of **"Improving the Equipment and Technology of its Production and Developing Diagnostics and Metals-Condition Monitoring Systems,"** since it has become a manufacturer and supplier as well as a consumer of AES equipment.

The CSSR is participating actively in improving individual assemblies of VVER-440 and VVER-1000 reactor installations (for example, modernized step drive for the control rods of the VVER-1000), in researching the radiation resistance of reactor materials in special heating chambers, changing their properties in static and cyclic loading, developing technology for annealing reactor bodies for prolonging their service lives and the like.

Much attention is being devoted to systems for diagnostics and for monitoring the state of reactor equipment as one of the most important conditions for safe and reliable AES operation. The Skoda concern is the coordinator of the work.

The goal of collaboration on the problem of **"Creating and Incorporating Effective and Reliable Automated Control Systems for AES Technological Processes and the Corresponding Equipment"** is to raise the economy, reliability and safety of AESs. Production specialization and cooperation of the countries is envisaged in the development and production of individual technical and program equipment. Organizations from several sectors are taking part in the coordination work, and the coordinator is the Elektromont enterprise.

The development of the problem of **"Raising the Maneuverability Properties of AESs"** (the Energoprojekt enterprise is the coordinator for the CSSR) will assist in resolving important issues of the electric-power system.

The problem of **"Improving Industrial Methods of Construction"** contains a number of topics on the technologies and methods for AES construction. Czechoslovak organizations are participating actively in the quest to optimize technological design solutions for individual construction elements and in creating progressive technologies, new special AES structural elements and means of mechanization in this realm. The work is being coordinated by Energoprojekt.

The implementation of the problem of **"Improving the Organization and Execution of AES Repairs"** envisages the creation of the appropriate equipment to conduct repairs as well as diagnostics. The program contains 55 targets, and Czechoslovak organizations are taking part in resolving the majority of them. The coordinator is the NII AES.

This same institute is the CSSR coordinator on the problem of **"Developing Measures and Means for Reconstructing and Eliminating AESs after their Service Lives are Completed."**

The CSSR has an immediate vested interest in specialization in the production of selected process equipment (press, burning installations, the bitumization and cementization of radioactive waste, transport containers and the like), and moreover in deliveries both for the needs of the CSSR and those of the other CEMA member countries.

**"The Development of Technologies and the Creation of Equipment for Processing, Transporting and Interring Radioactive Waste (RAO)"** relates to selected technologies and process equipment, including standard schemes for handling RAO at AESs and its compression, combustion, transport and interment. The coordinator is the NRI. The production and incorporation of some types of equipment for the needs of the CSSR has begun.

The solution of a number of problems is envisaged through collaboration in nuclear heating supply: creating process equipment for nuclear heat and electric power plants (ATETs), nuclear heating supply plants (AST) and for heat extraction from AESs; developing and incorporating safe systems for releasing heat from nuclear power installations; and, assimilating new methods for the efficient transporting of heat at long distances.

An agreement on collaboration in scientific and technical and planning work in the realm of ATETs and AST for the production of process steam and for the needs of power and heat generation was concluded in 1985. The coordinators of the work in this area are the Skoda concern and the Energoprojekt enterprise.

The goal of the work on the problem **"Creating Equipment for Fast-Neutron Reactors"** is the development and subsequent production of special fittings for AESs with FNR-type reactors.

This year, authorized organizations in the CSSR and the USSR are approving product ranges and fittings deliveries from the CSSR for BN-800 power units constructed in the USSR. The Sigma concern is the coordinator of the work.

There have been many years of collaboration between the departments for nuclear-power engineering in the USSR and CSSR on the problem of **"Creating Research Installations for the Realization of Various Technological Concepts in the Realm of Controlled Nuclear Fusion."** The detailed program of interaction approved at the 50th Session of the CEMA Standing Commission on Collaboration in the Realm of the Peaceful Use of Nuclear Power corresponds to the interests and capabilities of Czechoslovak organizations. The coordinator of the work in the CSSR is the NII [Scientific Research Institute] of Plasma Physics.

An agreement on the problem of **"Developing and Implementing a Set of Measures to Increase AES Reliability with a Regard for their Operating Experience"** is proposed for signing at the end of 1987. A program prepared

by the Soviet lead organization NII [All-Union NII] AES is currently being discussed. The Czechoslovak side has also developed proposals for it. The coordinator is the NRI.

The adoption of an agreement and detailed program on the problem of **"Creating Modern Programs and Equipment for Training Key Personnel for Nuclear Power Engineering"** is anticipated this year. The Coordinator of this work in the CSSR is the NII AES.

The proposed Czechoslovak obligations will be fulfilled within the framework of the state plan.

A draft program of collaboration on the problem of **"Developing a Unified Set of Standards and Technical Documentation in the Realm of Nuclear Power Engineering"** proposed by the Soviet lead organization of USSR Gosatomenergondzor [State Committee for Safety in the Atomic Power Industry] is being considered. The experience of Interatomenergo will be utilized therein. The CSSR coordinator is the NRI.

#### **A Solid Foundation for the Obligations of the CSSR**

The government of the CSSR is devoting especial attention to fulfilling obligations stemming from the tasks of the CP STP. Favorable conditions for their resolution have been created by the appropriate governmental decrees. Those responsible for the fulfillment of the assignments of the CP STP have been designated: the members of the CSSR government that are the chairman of the Czechoslovak Atomic Energy Commission (CAEC) and the chairman of the Czechoslovak Academy of Sciences.

A Governmental Commission on Nuclear Power Engineering headed by the deputy chairman of the government has also been created and will regulate issues associated with CSSR participation in work in the third priority area of the CP STP, including problems of specialization and cooperation in producing equipment for AESs.

An intersector working group under the chairman of the CAEC that includes deputy ministers from the interested sectors has been created for the preparation of quality materials on the participation of the CSSR in realizing the CP STP.

The rules for establishing direct ties between CSSR organizations and those of the other CEMA member countries, as well as the CP STP Guiding Principles for the CSSR, have also been approved by decree of the CSSR government.

The task is being posed of how better to utilize the conditions that have been created for the more complete fulfillment of the tasks ahead. CSSR proposals on the program for the third priority area of the CP STP had been developed as early as the first half of 1986, and

after their careful consideration they were distributed to the CEMA Secretariat, the USSR State Committee on Science and Technology, the USSR Ministry of Power and Electrification and the USSR State Committee on Nuclear Power.

They have also been sent additional material substantiating the participation of the CSSR in solving certain problems, as well as information on our productive base, deliveries, experimental equipment, jigs, the results of research and the like.

We have at the same time proposed mutual consultations with the Soviet organs under whose purview the lead organizations on CP STP problems fall. A number of them have already been held in the form of bilateral and multilateral negotiations. These consultations have helped in the solution of some problems and the discussion of Czechoslovak proposals. In the majority of cases, the Soviet lead organizations have adopted them and included them in the detailed programs of collaboration.

Much effort has been applied to preparing and realizing the third priority area of the CP STP by international and national organizations, and especially by the Soviet lead organizations and problem coordinators that are charged with the major portion of the executive activity, in the time that has elapsed since its signing.

More than a few issues requiring immediate resolution have arisen along with the positive results in this preparatory period.

First of all, the intersector coordination of problems is not always sufficient. Some lead organizations are inclined to limit their substance, especially in those instances where it goes beyond the bounds of their authority. The Gidropress OKB [special design bureau], the lead organization on the problem of "Improving Equipment and its Production Technology," has proposed being limited just to work on reactor installations, referring to the fact that the remaining equipment falls under the purview of other Soviet organizations.

Second, the agreements concluded before the 41st (Extraordinary) CEMA Session encompass only the stage of scientific and technical interaction, and supplements to them concerning production and applying the achievements of scientific and technical progress have yet to be prepared. This relates to the newly signed agreements as well. In the majority of cases, their detailed programs do not define the production stage of collaboration, and certain topics are frequently accomplished via reporting or the manufacture of experimental models or prototypes. The future manufacturers and consumers are insufficiently involved in the work.

Third, the conclusion of legal agreements (contracts) between the interested organizations is proceeding too slowly. Concrete negotiations on financing the work and providing for recouping the funds invested in research

and development of the production base have not yet been conducted. Some lead organizations and organs of CEMA are proposing the application of the principle that is still in use: "Each finances that part of the work that he has decided to fulfill himself." This method, however, provides no incentives for organizing the accelerated solution of problems and reduces the obligatory nature of the fulfillment of the work.

Enhanced attention must be paid to these issues in light of the decisions of the CEMA Session (42nd Session).

The third priority area of the CP STP is a program of collaboration to the year 2000. The gradual supplementing and elaboration of the programs and the technical and economic parameters of the equipment in them in accordance with world achievements is therefore essential.

The development of nuclear-power engineering and the construction of AESs and ASTs is determined by the level of the corresponding metallurgical, machine-building, electrical-equipment, construction and building-industry base. Problems of economics, nuclear safety, environmental protection, personnel training and, last but not least, the management and preparation of construction, including planning, creating and operating individual links in this system, must be systematically resolved along with technical and technological issues.

The third priority area of the CP STP should be considered as a unified whole, taking into account the comprehensive nature of its content. Its principal problems must be elaborated and supplemented. This is the principal task of the intergovernmental commission as a coordinating organ in this realm. This role can be successfully fulfilled only with the assistance of CEMA organs and working in close contact with the lead organizations and coordinators of some problems, to whom should be rendered effective methodological aid, and through the members of the intergovernmental commission have an effect on the corresponding national organs and organizations.

The chief designer of the Gidropress OKB and the general planner of Atomteploelektroproyekt (ATEP) [Nuclear Heating and Electric Power Supply Planning Institute] play important roles in ensuring the comprehensive nature of the innovation cycle and the link of AES research, development, production and operation. Only with their direct assistance can the results of problem solutions in the third priority area of the CP STP be taken into account in design and planning documentation. In my opinion, it would be expedient that this function of the Gidropress OKB lead organization be united with the function of chief designer and that this be fully utilized to take into account contemporary technical solutions in the overall scheme of nuclear

power installations. It would also be sensible to include ATEP in the incorporation of the results of CP STP fulfillment as a general AES planner.

The application of practical achievements in providing for the safe, reliable and economical operation of AESs is of no little importance. These issues were included in the problem "Developing and Implementing a Set of Measures to Increase AES Safety with a Regard for their Operating Experience." It would be expedient if the study of this problem were begun immediately and proposals and requirements for increasing nuclear safety be incorporated right in the plans, designs and construction of the AES. Essential herein is coordinating the activity of the various CEMA organs engaged in these problems.

The future manufacturers and consumers of new articles and technologies must also be involved in the fulfillment of individual assignments under the CP STP as early as the stage of scientific and technical collaboration in order that the consistency of the whole innovation cycle is not violated. In order to ensure its comprehensiveness, a closer unification of the third priority area of the CP STP with the program of construction of AESs and ASTs in the CEMA member countries to the year 2000 with a regard for supplying them with nuclear fuel and the essential equipment would be expedient. The fulfillment of this program depends on the solution of many problems envisaged by the CP STP. Such a consistent unification could strengthen the concrete and real nature, as well as the compulsory nature, of these two adopted documents.

The formulation of detailed programs of collaboration is currently basically coming to a close. The government of the CSSR has created favorable conditions for including Czechoslovak scientific research and production organizations in implementing the problems of the CP STP. The consistent fulfillment of the obligations of the CSSR will serve as a benefit for the development of the Czechoslovak economy and the whole socialist community.

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## HUNGARY

### **Finnish, Hungarian Nuclear Power Firms To Exchange Operating Data**

*51002449 Helsinki HELSINGIN SANOMAT in Finnish  
1 Jun 88 p 27*

[Text] An agreement to exchange information on operating experiences of the [Finnish] Loviisa nuclear power plant and a [Hungarian] plant located in Paks is to be signed next week in Budapest. Earlier this spring, Imatran Voima (IVO) International, the firm's export unit,

concluded a consultation agreement with the Paks nuclear power plant, according to which IVO will participate in a computer-based project management in Hungary.

The new pact is to be signed during the final day of President Mauno Koivisto's official state visit to Hungary in June, said Heikki Kauppi, chief of IVO International's section for CEMA countries, on Tuesday [31 May]. According to the agreement for continued cooperation, information on operating experiences is to be exchanged between the Loviisa and Paks power plants for the mutual benefit of both firms.

Great amounts of various materials, thousands of workers and tens of thousands of documents are required for

designing and constructing of nuclear power plants. To monitor all this, Imatran Voima has developed computer-based methods. Currently the joint project in Paks is being conducted based on IVO experiences, and it is succeeding well. Several Finns are serving rotating work assignments in Paks.

Located some 50 kilometers from Budapest, the Paks nuclear power plant has four Loviisa-type 440 megawatt units. In addition, construction has started on a second 1,000 megawatt unit. The 1,000 megawatt units being constructed in Paks are in type similar to the pressure reactors IVO built in Finland with Atomenergoexport.

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## ARGENTINA

### Financial Obstacles Threaten Continuity of Nuclear Plan

51002024a Buenos Aires LA PRENSA in Spanish  
3 May 88 p 9

[Article by Sergio Crivelli]

[Text] The president of Argentina is prepared to give his explicit political backing to the Argentine nuclear program, now threatened by possible paralysis because of budget cuts. The head of CONEA [National Commission for Atomic Energy], Emma Perez Ferreira, brought the chief executive up to date on the situation's gravity, telling him that without foreign financing for local work, construction of the Atucha II power plant and the Arroyito heavy water plant would have to be halted.

"Without foreign funding," explained CONEA's chair, "we can't continue this work. And if the budget cuts become a reality, I don't think we can continue. The president knows this, and he is very well aware that it is worth the effort we are making to get funding from abroad. He is prepared to back the initiative, that is, to give his explicit political support to the nuclear plan. But if the cuts force us to give up that attempt, we will have to stop work, although that will be painful both to us and to the president."

Despite repeated stories to the contrary, Dr Perez Ferreira stated that the budget was still open on the atomic energy issue at the time news reports were coming out about lack of interest on the part of foreign banks in the projects now in progress—Atucha II and Arroyito. She said that funding had been guaranteed by the suppliers for materials of foreign origin used in these projects.

#### Brodersohn Calls for Efforts

While the secretary of finance, Mario Brodersohn, is calling for an "effort"—that is, a decrease in their budget allocations—the CONEA officials estimate that they need \$100 million more than what was allocated in order to make the Atucha II investment efficient. They do not consider it possible that they will receive those additional funds, and they fear that the funds already allocated, about 1.7 billion australs (in December 1987 values), may be cut.

This amount includes personnel costs, operating expenses—75 percent of which will be recovered by the plant's operation—foreign loans and the still not completed amortization of the Embalse plant, as well as the costs of keeping the entire Commission running.

Construction of the Atucha II plant and of the Arroyito heavy water plant in Neuquen—the latter project is already 90 percent complete—has not been halted,

although some difficult problems have had to be overcome. Both projects were begun with nothing but funding from the treasury in sight as a source of financing for the local work.

Credits for foreign materials and components were guaranteed by the suppliers, but last year when the treasury had to allocate resources to pay Argentine contractors, it gave CONEA 25 percent of the funds in cash and 75 percent in debt payment bonds.

This led to some difficult negotiations which delayed the construction work, making the investment inefficient. Given these circumstances, CONEA decided to take steps to raise foreign funds for local work as well, since the Federal Republic of Germany, to mention just one instance, is interested in the completion of Atucha II, because the reactor to be used is of German origin.

"But if the cuts in the 1988 budget become a reality," said Emma Perez Ferreira, "it is useless to negotiate this funding, for we can't ask other people to make an effort that we are not prepared to make ourselves."

#### The United States and the Bomb

According to the CONEA head, the economic difficulties cited by the executive branch in financing the nuclear plan do not contain any intention of changing Argentina's present nuclear policy, as some sectors have suggested. She further described it as "a big mistake" to attribute to the foreign ministry any opposition to the autonomous strategy Argentina has pursued to date in the nuclear field because of opposition on the part of the United States.

"The Ministry of Foreign Relations is an extremely strong advocate of maintaining our nuclear policy," said Dr Perez Ferreira, "as it sees very close at hand the interest which our products arouse abroad and the possibilities arising from this interest. Moreover, since Ambassador Richard Kennedy's last visit about a month and a half ago, it has become fairly clear that the United States is beginning to understand our point of view and the fact that we want to have the complete fuel cycle, but without ever imagining that we might use our nuclear program for military purposes."

For years U.S. diplomacy has been putting pressure—in vain—on Argentina to sign the Tlatelolco and Nuclear Non-Proliferation Treaties. During the transition from the military regime to the democratic government, Washington had hopes that the Argentina refusal would disappear, but to its surprise it found that the position of the San Martin Palace had not changed. This is so because our government authorities feel that the Non-Proliferation Treaty is in violation of the principle of the legal equality of states, while in the Tlatelolco Treaty there is no reciprocity; it requires some countries like

Argentina to open up all their facilities for inspection, while others, such as the United States and the Soviet Union, are exempt from such control.

Moreover, Argentine officials say it takes the necessary precautions in its transfers of nuclear technology to other countries. Countries which purchase Argentine technology can not use it for military purposes, as all such sales are placed under safeguards.

### Why There Is No Bomb

As far as Dr Perez Ferreira is concerned, the option of Argentina using nuclear technology for military purposes has never arisen, for one quite practical reason, among many other possible reasons: the uselessness of building an extremely limited number of bombs, compared with the enormous arsenals already existing. She added: "I believe that if Argentina had already had the bomb or if it had been in the process of obtaining it when the Falklands War began, we would not be telling this story now."

Despite the logical validity of this reasoning, the constant pressures from the United States to minimize Argentina's autonomy as much as possible have been impossible to conceal. For this reason, the hypothesis of an interest that goes far beyond the non-proliferation problem, and is related to competition for the growing nuclear technology market, gains plausibility. The CONEA chair agreed that she does not rule out the possibility that the United States may be claiming to be suspicious about Argentine intentions in order to weaken our nuclear program and thus to avoid the rise of a new competitor.

### Out of Service

One of the components of the recent energy crisis was the fact that the Atucha and Embalse plants were both out of service, presumably because of maintenance defects attributable to budget limitations. In the case of Atucha I, CONEA's explanation emphasizes that after 14 years in operation, all its nuclear and conventional systems were given an extremely thorough check. The state of the latter systems delayed the plant's startup for about a month longer than had been planned, beginning the preliminary task of increasing power at the end of December 1987. Then a fuel channel cap which not been properly tightened came off, spilling 50 tons of heavy water in the reactor's container. Decontaminating the container and cleaning the water took from 22 December to 19 April. The accident occurred before the fission process had begun.

At Embalse, on 9 April an unexpected event occurred: a major frequency surge on the line because of the entry and exit of big industrial consumers. This phenomenon, caused by the fact that, for the first time, other plants located between Embalse and the consumers were out of service, caused a strong increase in pressure in a heavy

water circuit, the breakage of equipment and a change in the chemical composition of the water, with consequent delays in getting the plant operating again.

According to the authorities, in neither case should these events be blamed on a deterioration in the level of maintenance. Of course, such a suspicion did gain credence now that the nuclear plan is facing its greatest financial difficulties since it has become practically the sole instance of technological continuity and progress in Argentina over the course of the past 3 decades.

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### Advantages, Disadvantages of Nuclear Accord With Brazil

51002024b Buenos Aires LA PRENSA in Spanish  
25 Apr 88 p 8

[Article by Miguel J. Culaciati]

[Text] When, writing in LA PRENSA on 17 September 1979 and on 20 May 1980, the author of this article proposed a nuclear agreement with Brazil, he was suspected of responding to "dark designs" by the then chairman of the CNEA [National Commission for Atomic Energy], Admiral Castro Madero, and the same group of nationalistic officials that in one way or another continues to direct Argentina's nuclear policy.

At that time I went to Brazil on my own behalf and met with officials of the Brazilian Atomic Energy Commission, who certainly had a much clearer concept of what nuclear cooperation between our two countries should be.

Later, realizing that a bilateral context would not be sufficient to ensure nuclear progress in Latin America, much less nuclear safety and the non-proliferation of nuclear facilities, I proposed the creation of a South American Nuclear Organization in the style of what the Europeans did some years ago under the name of Euratom, suggesting that this regional organization might be named Sudatom.

This proposal was presented at two worldwide congresses on nuclear law, and was endorsed enthusiastically by the United States embassy as a suitable means of improving the safeguard system, which is of such concern to that nation, given the possibility that one of the more turbulent Latin American states might build an atom bomb.

The CNEA has always rejected the possibility of creating a regional organization and to date has favored bilateral accords by means of which it thinks it may be able to place its theoretical exports of Argentine technology to Latin America, and at the same time avoid control of the peaceful use of our nuclear facilities.

The nuclear officials of the process, extravagant administrators of an enormous budget, the origin of almost \$20 billion of our foreign debt, rejected this proposal, just as today their Radical Party successors continue to refuse to ratify the Nuclear Non-Proliferation Treaty and the Tlatelolco Treaty.

While the agreement with Brazil is a step forward, it will not be adequate so long as it is restricted to the small scope of a bilateral pact, and it certainly will not help give us access to modern and economical nuclear technologies. Nor will it keep us from continuing to be suspected of using nuclear energy for military or paramilitary purposes.

Furthermore, both Brazil and Argentina are going through difficult times, in which the possibility of major social upheavals can not be totally eliminated.

What would happen if in the midst of a crisis nuclear facilities were to fall into the hands of terrorists or if they were used by irresponsible political groups?

Moreover, our past record in international politics and our alignment with nations suspected of encouraging the most dangerous forms of terrorism, such as Libya, Cuba, Nicaragua, and more recently Mozambique, make us suspect as possible exporters of nuclear components or facilities that could end up in the hands of these governments, posing a grave international threat.

The president, counseled by his advisers from the CNEA and the MRE, has nicknamed the Brazilian pact the "New Tlatelolco," forgetting that our country was the principal promotor of the "old" and only Tlatelolco Treaty which we then refused to ratify, claiming that if we did so the developed countries might learn something new from our nuclear technology.

Tlatelolco can only provide security and peace for Latin America by attaining its much desired and sought for goal of making Latin America an area free from nuclear arms. At this time nuclear weapons could be freely stationed in any country which did not sign that excellent treaty.

Many benefits may be derived from nuclear cooperation with Brazil, a nation which has also made excessive and unproductive investments in its "Nuclear Plan" in association with our KWU [Kraftwerk Union] partner (Siemens).

Still, we should not lose sight of the fact that non-proliferation treaties subjected to adequate diplomatic handling would open up for us the doors of much more modern and economical technological sources in vast areas of the nuclear field.

For in the end, what do the countries that possess atom bombs want? They simply want us to submit to international inspections that will guarantee the peaceful use that we talk about so much.

If we really are not trying to make nuclear weapons, what is the point of this expensive subterfuge which in the end leads us to the same dependency, since 90 percent of both the Brazilian and Argentine nuclear enterprises are subject to international supervision?

Only some projects already attempted here in times of past madness, such as the nuclear submarine engine, might be a halfway logical reason if we didn't already know that if in the hypothetical event that we actually managed to build it, we wouldn't have anyone to whom to sell it, nor would it be of any use without nuclear missiles capable of firing while the submarine was submerged.

So while on one hand the accord with Brazil is good news, on the other it unfortunately confirms the fact that the diplomats of both nations are too immature to join with the developed world, and that they are still keeping on with the same voluntarist policies that have brought these nations to disaster, impoverishing their peoples. We should also ask ourselves what the Chileans will think about this, as they may feel threatened by this nuclear agreement. And what about the Cubans who could easily turn to their Soviet patrons, if they haven't already done so, asking them to send some missiles, just in case....

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**Country To Help Turkey Get Nuclear Technology**  
*NC3105081488 Istanbul HURRIYET in Turkish*  
25 May 88 pp 3, 15

[Atilla Atakan report: "Diplomacy With Argentina on Nuclear Technology"]

[Text] Buenos Aires, (HURRIYET)—Although the United States has come out against Turkey's sale to Pakistan of components used in the production of nuclear arms, reports say that Argentina's new ambassador to Ankara, Adolfo Saracho, a former head of Argentina's nuclear energy commission, will try "to help Turkey acquire nuclear technology."

Argentina is well-advanced in nuclear technology. Its decision to appoint Adolfo Saracho as its new ambassador to Turkey has made the U.S., USSR, and FRG diplomatic missions in Buenos Aires uneasy. They believe that Turkey's acquisition of nuclear technology would be disadvantageous. Adolfo Saracho made a significant contribution to the 3 May signing of an agreement between Turkey and Argentina for "cooperation between the two countries in nuclear technology." The new ambassador arrived in Ankara yesterday.

Prior to his departure from Argentina, he told HURRI-YET: "We would like Turkey to learn about the technology Argentina has acquired during the past 20 years. We can help Turkey build reactors and nuclear power plants in the future. Our objective is to help Turkey develop its nuclear technology, without depending on any country or bloc."

Noting that Argentina objected to any interference by the superpowers in its work in nuclear energy, Adolfo Saracho noted that Argentina made it a condition that nuclear technology be used passively and for peaceful purposes. He said: "I know my task is difficult. Due to its proximity to countries which cooperate with Argentina, such as India, Iraq, Algeria, Romania, Yugoslavia, and Albania, Turkey is a very important country."

### **Foreign Financing Sought for Nuclear Program**

*PY3105211888 Buenos Aires TELAM in Spanish  
1540 GMT 31 May 88*

[Excerpt] Buenos Aires, 31 May (TELAM)—CNEA President Emma Perez Ferreira has announced that efforts are being made to get financing from Switzerland and the FRG to continue building the Atucha II nuclear plant and the Arroyito heavy water plant.

She also said that the current CNEA budget is similar to its 1987 budget and that the possibility of getting foreign financial aid was accounted for in the current budget.

She made these comments at the conclusion of the celebration marking the 38th CNEA anniversary and "Atomic Energy Day." She added that the funds provided by the national treasury are not enough to continue with the Atucha II and Arroyito plants.

She said the projects will not stop if foreign financial aid is obtained. In this regard she added: We either get foreign financial aid to make a good investment to continue the projects, or we will have to stop them.

In a speech during the ceremony at CNEA headquarters, she said the current budget is not as large as in the past, but we must be aware of the serious economic crisis affecting our country.

She concluded by saying that the recent energy crisis clearly showed the vulnerability of the national electrical system and the important role played by the CNEA nuclear plants.

### **Bariloche Institute Trains Future Nuclear Engineers**

*51002024c Buenos Aires CLARIN in Spanish  
20 Mar 88 p 8*

[Article by Daniel Arias B.]

[Text] Argentina's top engineers graduate from Bariloche. They are exhausted when they leave, for the academic demands on them are fierce. But they also graduate with jobs in sight: the training given at the Balseiro

Institute produces people familiar with extremely diverse areas, and each graduate carries a seal of intellectual quality from the CNEA [National Commission for Atomic Energy].

Two consecutive decades of university deterioration have left the CNEA alone in the vanguard in research and the teaching of pure and applied sciences. Our few high-tech industries know this. They literally pursue these graduates.

This is quite significant in a country where young engineers drive cabs while dreaming of moving up the ranks in the management bureaucracy in any business, resigned in advance to spending their lives outside of engineering. Strangely, the only program that to some extent grants immunity against frustration, the Bariloche program, doesn't have many students enrolled; the average student either isn't aware of it or thinks that a nuclear engineering degree would trap him in terms in jobs in Argentina's lagging nuclear program.

That is untrue: a nuclear engineer is by definition a generalist, a sort of multispecialist capable of coming to grips with problems of very diverse natures, both in conventional engineering and in what is, strictly speaking, nuclear engineering.

In an economy marked by severe upswings and downturns, a broad engineering background is the best possible training to have in order to avoid slipping or falling in one's career. It has been possible to acquire this background in the south for the past decade. And it is free, for anyone who survives the admission requirements (which are quite stringent, of course) gets a scholarship, housing, supplies, books, a computer, and the use of equipment that leaves the outdated labs of our university system back in the Stone Age. And still the prejudice against ultraspecialization means that the Balseiro Institute's Nuclear Engineering Department awards fewer degrees than the market can absorb.

### **A World Apart**

The CIN [Nuclear Engineering Department] was set up a decade ago as part of the CNEA's contradictory and off-and-on effort to make itself self-sufficient in nuclear technology, using as a basis the extensive educational experience of the Balseiro Institute, which had been training the best South American physicists since the 1950s. The unusual feature of the Balseiro educational system is at the very heart of its success: the professor and the student are both full-time professionals to whom the CNEA devotes great attention so that one will teach and the other will learn, and both will do research. The students can live on the campus of the CAB [Bariloche Atomic Center] which, in addition to housing and meals, provides very well equipped labs, a research reactor, a particle accelerator, one computer per person, an up-to-date library, clean air, hills, woods, lakes, and almost



total freedom from pollution, crowds, and bureaucrats. Included in the package is something truly rare: a teaching faculty dedicated to research.

It's hard to believe all this exists in the south. It is one thing to learn from someone who transmits knowledge generated by third parties, and something quite different to learn from a creator of original knowledge. In the latter case, teaching and learning become highly personal and serious matters: the pace of study is more or less heroic, and the demands leave little time for rest. But in exchange, the people here live casually. Almost everyone in this world apart at the CAB addresses everyone else familiarly and wears running shoes (when it isn't snowing).

The students play tennis in the tennis courts, organize movie parties, play music, climb mountains, ski, love each other, hate each other, throw big parties, and look like absolutely normal people until you read the posters they put up complaining about the stinginess of their scholarships, in which they illustrate their points using complex computer-generated graphics.

All this is a tiny sample of what some people are calling "chip imperialism." Computers are part of the air that people breathe in the Balseiro Institute; there is roughly one PC per student, and many really powerful computers like the Micro-Vax and Vax. All this equipment means that they can deal with almost everything by computer, in addition to the two areas that are specially devoted to computers. The use of computer models and simulators is so intensive, extensive and invasive that the most stubborn professors growl that the thing is becoming a problem because the students end up thinking that their mathematical representations of reality are reality.

The young men and women naturally design their own software or do hands-on work on the existing software to improve it, and they attain such an intuitive grasp of systems engineering that they end up excelling in a field that is unknown to the graduates of specifically computer departments. This is starting to be recognized, not just here but in Brazil as well.

CIN students may specialize in four major conventional engineering areas: thermohydraulics, mechanics, control and materials, and fuels.

In the first group there are people skilled in designing turbines (something which Argentina now has to import). The second group includes some very rare creatures who are able to design components by using computer mechanics systems, something only poorly understood in Argentina. In the third group are people capable of operating all sorts of production plants, ranging from petrochemical to aeronautical facilities. The fourth category includes metallurgists and advanced ceramicists, as well as experts in composite materials. All of them form a brain pool which is, unfortunately, quite an exception in our country. Every time the Swedes, the

Germans or someone else lure a graduate away, our country loses \$50,000 in what was spent on his or her education. Specialists in conventional areas devote themselves to neutron work, to radiological protection and to nuclear safety (areas quite internal to the CNEA), although "of necessity they have to become despecialized," as one student commented, saying that an expert in industrial safety in nuclear plants, transplanted to the chemical industry "gets old and out of date."

The CIN is not a nursery for brainy aristocrats. It is a small educational lifesaver for a country experiencing enormous difficulties in science and technology. Like the Balseiro in physics, like the CAB in research, this department is a sample of the nation that is possible, one that is more capable and independent than the real nation, and also more attentive to its gray matter resources. People wishing to enter the CIN should request applications from the Bariloche Atomic Center, Balseiro Institute, 8400 Bariloche, Rio Negro province. In the Buenos Aires area information may be obtained by calling 701-2333. Applicants must have the equivalent of 2 years of passing grades in related fields, and be willing to undergo a very strict selection process that includes tests in physics, mathematics and chemistry, to be taken during the first 2 weeks of July. The application deadline is 30 April.

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#### **CNEA Announces Scholarship Plan**

*51002024d Buenos Aires CLARIN in Spanish  
17 Mar 88 p 41*

[Text] The CNEA [National Commission for Atomic Energy] has announced a scholarship plan for graduate programs in physics and in nuclear engineering at the Balseiro Institute, which is affiliated with the CNEA and with Cuyo National University.

To be admitted to this prestigious center located in San Carlos de Bariloche, applicants must meet the following requirements: they must be a native or naturalized citizen of Argentina, have passed, before 31 July, courses in linear algebra, analytic geometry, differential and integral calculus of several variables, mechanics, heat, electricity, sound and optics in any science or engineering department of any university in Argentina, or have completed a teaching certificate program in physics or mathematics.

The scholarships cover housing, meals, laundry expenses, complete medical care, and two round-trip fares per year.

#### **Duration**

The master's program in physics lasts for 3 and 1/2 years and the nuclear engineering program for 4 years. Afterwards, a dissertation must be approved for the student to be awarded a doctoral degree in physics or in nuclear engineering.

The applicants selected, based on an entrance exam to be taken during the first 2 weeks in June in Buenos Aires, will begin their studies on 1 August 1988.

Interested persons who meet the requirements must also present a medical certificate attesting to their good health. Additional information and registration forms may be obtained from the Balseiro Institute, Bariloche Atomic Center (Cod. 8400), San Carlos de Bariloche, Rio Negro. Telephone: 33604/22646/23065. Telex: 80723 CAB AR.

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### BRAZIL

**Nuclebras Head Proposes 4 More Nuclear Plants**  
*PY1905235588 Sao Paulo O ESTADO DE SAO PAULO in Portuguese 18 May 88 p 10*

[Text] Nuclebras President Licinio Seabra has proposed the construction of four more nuclear power plants at a cost of \$7.7 billion. Seabra submitted this proposal to the

Senate CPI [Congressional Investigating Commission] that is investigating the causes of the cesium-137 accident in Goiania in October last year.

Seabra assured the commission that the construction of four nuclear power plants, just as the three in Angra dos Reis, "would not entail any danger of a nuclear accident" because of the great technological progress in this field and because the public is currently trained for emergencies. Seabra argued that the country "will have to face the reality of the year 2010."

**Angra I Nuclear Plant Operation Delayed**  
*PY2505140788 Brasilia Radio Nacional da Amazonia Network in Portuguese 1000 GMT 25 May 88*

[Text] Furnas Chairman Camilo Pena has said the operation of the Angra I nuclear plant has been delayed once again. Furnas is suing the American Westinghouse company and is demanding compensation for damages caused by a malfunction in the Angra I power generator.

According to Camilo Pena, Angra I will be operational in December, not in September as originally scheduled.

## BANGLADESH

### Energy Minister Addresses Atomic Energy Officials

51500171 Dhaka THE BANGLADESH OBSERVER in English 23 Apr 88 p 3

[Text] Savar. (Dhaka), Apr 22—Energy and Ministerial Resources Minister A. B. M. Ghulam Mostafa said on Thursday that the government had taken steps to establish a nuclear power plant in the country, reports BSS.

He said necessary measures would be taken to install Rooppur Nuclear Plant to materialise the government's objective.

Mr. Mostafa was addressing the scientists and officials of Bangladesh Atomic Energy Commission at the installation ceremony of newly elected office bearers of the association of scientists at the Atomic Energy Commission auditorium at Savar, according to a government handout.

The Energy Minister said that Bangladesh Atomic Energy Commission was formed in 1973 with an objective to utilise atomic power for peace.

With the increasing demand of atomic power the commission had so far established Atomic Energy Centre, Dhaka, Atomic Energy Centre for Medicine and Research Centre to extract mineral resources from sands of the seashore at Chittagong and the Atomic Power Research Organisation at Savar. Besides, one Nuclear medical centre had been established under the commission.

Mr. Ghulam Mostafa urged the scientists to ensure maximum utilisation of the limited resources to make the country prosperous in all respects. He said, training facilities for the scientists at home and abroad would be increased. He also stressed on special budget allocations for scientific research which would be helpful to improve the quality of research work in the country.

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## INDIA

### Pakistani Nonproliferation Proposal 'Dismissed'

BK1406075088 Delhi Domestic Service in English 0730 GMT 14 Jun 88

[Text] India has dismissed the renewed Pakistani proposal for bilateral nuclear nonproliferation as a propaganda ploy. Speaking at the third special UN General Assembly disarmament session last night, the Indian envoy, Mr C. Ghare Khan, said the so-called proposals by Islamabad are only meant to conceal reality. He said the fact remains that Pakistan is very close to acquiring nuclear weapons, if it has not done so already. Mr Ghare Khan said nuclear nonproliferation cannot be a bilateral

matter between India and Pakistan, when the whole neighborhood is bristling with nuclear weapons. He referred to the prime minister, Mr Rajiv Gandhi's 22-year plan to do away with atomic weapons and said if Pakistan is serious, they should address themselves to that instead of engaging in futile propaganda gimmicks.

### Gandhi Views Nuclear Capability

BK0806162688 Delhi Domestic Service in English 1530 GMT 8 Jun 88

[Text] The prime minister, Mr Rajiv Gandhi, has said that India need not sign the Nuclear Nonproliferation Treaty [NPT] because it has not made the bomb. Addressing a press conference in Bonn at the end of his 3-day visit to West Germany, Mr Rajiv Gandhi said that we have demonstrated our will not to make a nuclear weapon. We have had the capability for some time now, but we are very clear that we do not want to go down that road. He said that India feels that the NPT discriminates between nuclear-weapon countries and nonnuclear-weapon countries.

## PAKISTAN

### Indian Charges on Nuclear Program Rejected

BK1406160888 Islamabad Domestic Service in Urdu 1500 GMT 14 Jun 88

[Text] Pakistan has rejected Indian allegations that Islamabad's nuclear program is weapons oriented. Ahmad Kamal, Pakistan's UN envoy, told the General Assembly's special disarmament session that there is not a shred of truth to those assertions. He referred to a Carnegie Endowment report, which noted that India had collected 100-200 kg of plutonium, which could be used to manufacture 12-40 nuclear weapons.

Ahmad Kamal reaffirmed Pakistan's determination to establish tension-free, good-neighborly relations with all its neighbors. He called on India to test Pakistan's gesture of friendship. Referring to India's claims of peaceful intentions in the nuclear field, the Pakistani envoy said they must be made concrete through a treaty.

### Spokesman Denies 'Secret' Nuclear Pact With Iran

BK1406160588 Islamabad Domestic Service in Urdu 1500 GMT 14 Jun 88

[Text] According to a Foreign Office spokesman, Pakistan has not signed any secret nuclear pact with Iran. Denying reports published in certain foreign newspapers on the existence of such an agreement, the spokesman said that no Pakistani scientist has visited Iran's nuclear plant in Bushehr in recent years, nor has any Iranian nuclear expert received advanced training in Pakistan. He added that there is no question of a secret agreement, as Iran is one of the countries that has already signed the Nuclear Nonproliferation Treaty, and its nuclear facilities are subject to international safeguards.

**Nuclear Techniques Boost Farm Produce**  
51004726 Karachi DAWN (Supplement) in English  
14 May 88 p III

[Article by Mahmud Akhtar Faruqi]

[Text] Nuclear techniques offer the fascinating prospects of raising and preserving plentiful crops and fruits. Thanks to the enterprise and ardour of the agricultural scientists, the techniques have been gainfully employed on a global scale to give a marked fillip to farm productivity.

At home, an outstanding success in recent years has been the evolution of NIAB-78, a high yielding cotton variety at the Faisalabad-based Nuclear Institute for Agriculture and Biology. NIAB-78 has added 1.55 million and 1.38 million bales during 1986-87 and 1987-88 respectively to the total produce, signifying a financial gain of Rs2,950 million and Rs3,600 million!

Approved for general cultivation in 1983, NIAB-78 stands unrivalled as the country's highest yielding cotton variety and has won wide acceptance in the Punjab and upper Sind alike.

**Nuclear Techniques**

The important applications of isotopes and nuclear techniques in improving the efficiency of water and fertilizer, evolution of improved varieties of crops, preservation of fruits, etc. are seen to offer a fascinating field for adventurous experimentation in an area which is of fundamental importance to the country. Realising this quite early, the Pakistan Atomic Energy Commission (PAEC) chalked out a programme for establishing research centres equipped with the best radiation facilities and staffed with highly trained agriculturists and radiobiologists. Three full-fledged research establishments at Tandojam, Faisalabad and Tarnab have been engaged in extensive and intensive research to improve agricultural products of economic importance and to solve outstanding problems confronting the country's farmer.

Over the years, the research and development effort has been crowned with some notable successes and over 13 varieties of wheat, rice, cotton, mungbean, chickpea, and potato with improved characteristics as regards yield and resistance to disease and commonplace pests, have been successfully released for large scale cultivation in different regions of Pakistan.

Following are better crop varieties at PAEC centres:

Cotton (NIAB-78): High yielding, heat tolerant, matures early. Increased production due to this variety was 1.55 million bales in 1986-87 and 1.38 million bales in 1987-88 (est.).

Wheat (Jauhar 78): High yielding better quality grain. (Sind 81): high yielding resistant to rust. (Sarsabz): high yielding, genetic versatility.

Rice (Kashmir basmati): Early maturing, cold tolerant. (Sahdab): better yield extra long grain.

Chickpeas (CM72): Resistant to blight disease.

Mungbeans (NIAB Mung 28): Short statured, uniform maturity.

Besides NIAB-78, three outstanding improved varieties of wheat—Jauhar-78, Sind-81 and Sarsabz—have yielded richer dividends for the planters and are most popular in the province of Sind. Wheat being the central theme of the country's self-sufficiency programme, the development Jauhar-78, Sind-81 and Sarsabz, marks PAEC's significant role in advancing the Green Revolution. The Atomic Energy Agricultural Research Centre, Tandojam, where the three wheat varieties have been evolved has also developed novel wheat germ plasm (consisting of more than 250 new strains) which is being used nationally and internationally in vigorous plant breeding programmes.

Kashmir Basmati, an early maturing dwarf variety of rice suited to higher altitudes and colder climates, has also been evolved in PAEC labs and cultivated in Swat, Azad Kashmir and Hazara while Shadab, a high yielding non-aromatic fine grain rice variety, is expected to substantially boost rice production in the province of Sind. A blight-resistant variety of chickpea, CM-72, introduced in 1983 has also shown results by stabilising the previously uncertain market for this crop. In addition, five mungbean varieties and a potato variety have been profitably cultivated.

The PAEC scientists have also demonstrated that reclamation of non-productive saline soils is possible by applying a biological technique based on the use of Kallar grass. It has also been established that wheat, rice, etc. can be safely and effectively disinfested by gamma irradiation while the shelf-life of some fruits can be extended appreciably by exposure to gamma rays.

It has now been established that atomic radiations (mainly gamma rays) readily induce hereditary changes (mutations) some of which are stable and lead to new traits manifested also in subsequent generations. This effect can be taken advantage of in evolving new varieties of crops with higher yields, better resistance to disease and pests, and greater response to fertilizer application.

Radioactive isotopes can also be used as tracers, as in medical applications, in order to follow the pathways of synthesis of different compounds in the plants, the mode of absorption and distribution of nutrients under various soil environment and the uptake of nutrients from the

leaves. The mode of action of growth regulators and the effects of pesticides on plants can also be explored through labelled compounds.

**'Sterile Males'**

The control of field crop pests and stored food pests is of great economic importance to farmers and consumers alike. The application of atomic radiation and radioisotopes has opened up new possibilities for the effective eradication of these pests through the 'sterile male' technique. This technique enables one to eradicate specific species of insects harmful to field crop by releasing a large number of sterilized male insects in the natural population; the method obviously does not affect the beneficial insects.

Radiation can also eliminate all sorts of stored grain pests without leaving any undesirable residual effects on

the commodity thus treated; this method complements and improves upon the preservation of grain by fumigation or spray of insecticides. Further with the use of radioisotopes, the biological habits of insects, such as their range of movement, hibernating tendencies, etc. can be studied by releasing labelled insects and recovering them later at other locations.

Nuclear techniques have thus proved to be of great value in agricultural research: they enable the research scientist to make a two-pronged attack on the problem, viz. the evolution of better and more productive varieties of plants as well as the preservation of the harvested products. The progress on this front in the country is gratifying.

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**Soviet Assisted Electrification of Afghanistan Noted**

51000001e Moscow SOTSIALISTICHESKAYA  
INDUSTRIYA in Russian 9 Feb 88 p 1

[TASS article: "Helping Friends"]

[Text] The route toward the southern border was taken yesterday morning by a brigade to assist Afghanistan—rural electrification workers of Mari Oblast. They are starting construction of a high-voltage power transmission line for the friendly neighboring country.

Assistance in electrifying the northwest province of Afghanistan is one of the points of the agreement concluded several months ago on direct patron relations between Mari Oblast and the province of Badgis.

The agreement was officially ratified and continued the long-standing ties between the oblast and the provinces of Afghanistan. There were over 20 points in the agreement. It specified that agricultural equipment, cotton seeds and fertilizer, electrical tools and sporting goods be supplied to Badgis.

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**Power Station Parts Shipped to Vietnam**

51000001f Moscow SOTSIALISTICHESKAYA  
INDUSTRIYA in Russian 20 Feb 88 p 1

[Article: "For Our Vietnamese Friends"]

[Text] The last hydroturbine for the Chian Electric Power Plant in Vietnam will be shipped by the Lenin-grad Metal Plant Association in the second quarter, not in the third, as was planned.

This is one of the most important points in the commitments of the turbine builders, who developed a competition for a worthy greeting for the 19th All-Union CPSU Conference.

"The purchasers, who were having great difficulty with power supply in South Vietnam, asked us to accelerate the machine output," says T. M. Lamm, chief engineer. "Because of the shortage of electric power the enterprises there have to work in rotation. The start-up of the electric power plant will in many ways solve the problem."

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**Cuban AES Construction Progress Report**

51000001g Moscow SOTSIALISTICHESKAYA  
INDUSTRIYA in Russian 23 Jan 88 p 3

[TASS article: "Safety Is Guaranteed"]

[Text] Cien Fuegos, Cuba—22 (Jan 88)—(TASS)—The collective of construction workers of the first nuclear electric power plant, Juragua, erected with the assistance of the USSR, is faced with important and crucial tasks this year. Today the plan for construction of the first two reactors of the AES has already been over half fulfilled. Implementation of the plan has arrived at a stage characterized by a growing level of complexity in the construction and installation work. Also slated for this year is the laying of the second section of the AES, consisting of the third and fourth reactors, each of which will make it possible for the country to save 600,000 tons of oil a year, reported Julio Trujillo, chief of construction for the Juragua AES, in an interview with a TASS correspondent.

"Ensuring the quality of work at the country's major power project is a priority task," he emphasized, "and each one of our multi-thousand-member collective realizes it. Adherence to all the standards, ensuring the safe operation of the AES in the future, is monitored with maximum strictness. The state and international commissions who visit the construction site regularly have come to this conclusion. Hans Bleeks, general director of the International Atomic Energy Agency (MAGATE), expressed his authoritative opinion concerning this during a recent stay here. On the basis of his familiarity with a number of nuclear electric power plants operating in other countries," said Julio Trujillo, "I can confirm that the Juragua AES will be one of the safest."

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**General Claims U.S. Military Aid to Pakistan Encourages Nuclear Ambitions**

18070076 Moscow LENINGRADSKAYA PRAVDA in  
Russian 16 Feb 88 p 3

[Article by Major General F. Gontar, candidate of military sciences, USSR Academy of Pedagogical Sciences: "Project 706"]

[Text] A couple of days ago in Belgium a large scandal broke out in connection with the fact that containers of nuclear materials were illegally sent to Pakistan from the Center for Nuclear Research in the Belgian city of Mol where an enterprise is in operation for enriching uranium by the gas centrifuge method. This dangerous "leakage of nuclear technology" was announced at a press conference in Brussels by the Belgian Minister of External Relations Leo Tindemans.

This is one of many examples in which Islamabad through illegal tricks acquires from Western countries equipment, technology and materials necessary for manufacturing nuclear weapons. Thus as early as 1976-1979 equipment, important components, parts and technical documentation for gas ultracentrifuges were secretly shipped from West European countries (the Netherlands, the FRG, Great Britain) to Pakistan. The basis of these in the Scientific Production Atomic Center of Kahut (30 kilometers east of Rawalpindi) a plant was constructed for obtaining both "arms" uranium (containing more than 90 percent of the isotope 235) and for producing slightly enriched uranium for atomic electric power stations (containing up to 5 percent of the isotope 235).

According to an announcement in the WASHINGTON POST published last summer, at the gas centrifuge plant in Kahut the level of enrichment of the uranium exceeds 90 percent, which makes it possible to use it in charges for nuclear weapons. According to the estimates of American experts, the quantity of uranium enriched this way that has already been produced in Kahut is "sufficient for manufacturing only a few atom bombs."

Another example. In the middle of last year the NEW YORK TIMES announced that during 1982-1983 the Pakistani company Aftab Brazers made four secret deliveries of ultramodern computer equipment and oscilloscopes from the United States through Hong Kong. These are used in Pakistan in designing explosive components and detonators for atomic bombs.

According to announcements in the foreign press, in 1986 Islamabad managed to acquire from the United States a large batch of special ultrarapid electronic devices—Krytons, which were delivered to the atomic center of Kahut and were already used there when testing explosive devices intended to be used with nuclear ammunition.

Quite recently the West German magazine DER SPIEGEL published an article exposing the firms Muchem and Transnuclear for illegal sale of enriched uranium to Pakistan.

The aforementioned and also other cases revealed in recent years of secret purchases by Pakistan of materials, equipment and technology for atomic production show clearly that Islamabad authorities are persistently creating a scientific industrial base that is capable of producing their own nuclear weapons. This is shown also by the fact that in the region of Kundian they have created the second atomic center in Pakistan in which they are constructing a radiochemical plant for extracting plutonium from heat discharging fuel cores that are used in nuclear reactors.

With the startup of this plant Pakistan will have the possibility of extracting on an industrial scale plutonium obtained during the operation of atomic electric power

stations. At the present time in the region of Kayachi there is an AES with a capacity of up to 140,000 kilowatts. Construction is being conducted on the second station with a capacity of up to 90,000 kilowatts in the region of Kundian, which will also operate on natural uranium. Under certain conditions for the operation of nuclear reactors of these atomic electric power stations it is possible to obtain plutonium from them (containing more than 90 percent of isotope 239) that is suitable for use in nuclear weapons. Practical work for creating individual components of nuclear ammunition is concentrated in the nuclear center of Kahut, in the Institute of Nuclear Science and Technology in the city of Nilor and also at the defense complex in Vakh where they have created a subdivision for developing a nuclear charge.

On the whole one can draw the conclusion that Pakistan has created a closed technological cycle that is capable of producing nuclear ammunition on a limited scale. This was unequivocally announced by President Zia-ul-Haq who, in an interview with TIME magazine, admitted with impressive candor that his country has the potential to produce nuclear weapons. Clearly reacting to international appeals to halt efforts to create an atom bomb, Zia-ul-Haq defiantly stated: "When you have the technology that Pakistan has you can do with it what you want to." Incidentally, the information to the effect that Pakistan has created a production base for manufacturing nuclear charges is also confirmed by data from American intelligence. Referring to statements of highly placed workers, the UPI in November of last year announced that Islamabad "definitely has a real nuclear device."

It would seem that everything is clear. The Islamabad leadership, having refused to sign the Nuclear Weapon Nonproliferation Agreement, is doing everything to fully complete its work for arranging series production of the "Islam" nuclear bomb, which has been under way in Pakistan since 1976 under a program with the code name "Project 706." As we know, the goal of this program is to provide for equipping the Pakistani armed forces with nuclear weapons.

Attention is drawn to the fact that the American administration, in spite of Pakistan's nuclear ambitions, continues to render it large-scale military and economic assistance. While during 1981-1986 the amount of this assistance was \$3.2 billion, in keeping with the new agreement, during the next 6 years Islamabad will receive \$4 billion worth of military and economic assistance. The majority of this astronomical sum will go for paying for deliveries of the most modern American offensive arms. They include the F-16 fighter bomber, which is a nuclear arms carrier, the latest Abrams M-1 tanks, Cobra fire support helicopters, self-propelled and towed 155- and 203.2-mm howitzers, military ships, radioelectronic equipment, and other of the latest means of armed combat.

With American assistance Pakistan has actually become its own kind of immense arsenal for the Pentagon in the south of the Asian continent. And this is done to bypass the "Simington Amendment" which prohibits granting military and economic assistance to countries that are developing their own nuclear weapons. Washington's hypocritical position can be seen here. In words the American administration has been in favor of observing the Nuclear Weapon Nonproliferation Agreement, regarding it, as President Reagan assures us, as a "cornerstone of American policy," but in fact the United States by granting Islamabad mass military assistance is actually encouraging its nuclear ambitions which are directed toward possessing nuclear weapons.

A quite natural question arises: why is Washington so generously supplying Pakistan with modern arms and rendering it large-scale military and economic assistance directed toward unrestrained militarization of the country which contributes, essentially, to the creation of a dangerous nuclear arsenal in this country?

There can only be one answer to this question. The ruling circles of the United States regard Pakistan as one of the major springboards for their imperialist strategy with the goal of exerting direct military pressure on the states of South and Southeast Asia and countries adjacent to the region of the Persian Gulf. In the Pakistan arena Pentagon strategists intend to keep constantly in their sight this immense region of the planet which includes also the Indian Ocean zone. Essentially the White House prefers to sacrifice the principle of "nonproliferation of nuclear weapons" if only it can keep Pakistan in its sphere of unlimited influence. Here one can clearly see Washington's desire to break apart the existing alignment of forces in South Asia to the detriment of India, which has been following an independent foreign political course.

By transforming Pakistan into a source of constant tension in the region, including its territory in the "zone of responsibility" of American rapid deployment forces and closing its eyes to the creation of nuclear weapons in this country, the ruling circles of the United States are contributing to the destabilization of the system in the countries of South Asia and the region of the Persian Gulf and creating an explosive situation there. All this cannot but cause legitimate concern and alarm among all those who value peace on our planet.

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#### **Anti-Nuclear Stance Described**

*Moscow KOMSOMOLSKAYA PRAVDA in Russian*  
27 Jan 88 p 2

[Article by V. Umnov: "Chain Reaction: Fear of the Unknown—What It Turns Into and the Consequences"; first paragraph is letter to the editor; second paragraph is comment by I. K. Dibobes, laboratory head of the Institute of Applied Geophysics]

[Text] "Guided by a sense of citizen's responsibility, we request that work on the construction of the Krasnodar

Nuclear Electric Power Plant be ceased. This problem must be thoroughly examined, in consideration of public opinion."

"The problem is submitted for discussion prematurely. A commission has been set up and specialists are examining all the variants of further development of the power system in the Northern Caucasus. Public opinion must not be fired up. We will be having talks in a month, when the decision will be made."

The decision was made.

It was an unprecedented case: the recently begun construction of the Krasnodar Nuclear Electric Power Plant at the end of last year came to a halt. It was decided to seek a new site for the AES.

This happened after complaints flowed in to the country's Ministry of Atomic Power from the Kuban citizens about the construction that had begun. We received one of them. "There are many alarming and contradictory rumors circulating about the problem. They arise because of lack of information. Investigate them!" Vera Neronova, a student from Kuban University, asked the editors.

This happened after the Minister of Atomic Power entrusted the Atomenergoprojekt Institute with preparing material for the newspaper SOVETSKAYA KUBAN, explaining to the public that only the AES could solve the problem of the region's power independence.

The explanation for the public had already been handed over for typing, when it became known: the construction had ceased.

Nevertheless, atomic workers continue to think even now that there was no mistake. Only the elementary illiteracy of the authors of the letters on problems of nuclear power caused the purely instinctive fear, which was impossible to disregard in this situation. Taking this into consideration, the present leaders of the kray came out decisively against the construction of the AES—just as decisively as had the former leaders, two years earlier, insisted on directly the opposite.

This, however, was before Chernobyl.

Before Chernobyl, it was not only advantageous—it was even prestigious—to have a nuclear plant. In addition to the power independence, it also guaranteed increased attention being paid to the "nuclear region," specialized employment, housing, and social, cultural and every-day facilities. Georgia and Azerbaijan achieved the construction of AES. Others, in the words of R.G. Minasyan,



chief specialist of the technical division of Atomenergoprojekt, even resorted to unfair shuffling: if the conditions were not appropriate, they could be substantiated on paper. True, competent commissions discarded the proposals that were too persistent.

Krasnodar Kray was also among the applicants. It was successful. Atomenergoprojekt took on the work. The work was not simple: not far away was the Caucasus biosphere preserve, rich Kuban fields just a stone's throw away from the health resort areas.

But then the whole world began to talk about Chernobyl. Then the chairman of the krayispolkom made a speech on local television against construction of the AES. His speech was already supported by public opinion....

Does it turn out that the cause of everything was only public opinion, which, after the Chernobyl tragedy, could simply not help but be heeded? The case of the Krasnodar AES, perhaps, is the first evidence of this. But—it is not the only one. "Could a nuclear plant really be constructed in our republic, where earthquakes occur almost every month?"—they write from Armenia. They are now writing to the Ministry of Atomic Power from the Ukraine, from Belorussia, from all the countries. The two dozen AES in operation and almost all of those under construction are bitterly disputed by local residents. It is a chain reaction....

I think that this situation is not surprising today. We have also read about "antinuclear" demonstrations in other countries, and about the referendum in Austria, which decreed that no AES at all could be constructed, and also about the dangers linked with this in the United States.

No, I cannot agree with I. K. Dibobes: open and competent discussion is not only not premature, but on the contrary, is obviously late.

What is surprising here is: technical progress has never managed to avoid arguments, and with the responsibility that is involved today in each step of it, it simply cannot by-pass controversy—moreover with the widest audience.

I am convinced: under the conditions of the development of democratization, arguments are not in themselves terrible. It is uncertainty, hesitancy and ignorance that are terrible. Literally: "I do not know—therefore I am afraid."

The development of technical progress (throughout time) has aroused resistance only where it has not been accompanied by the development of the technical literacy of the population.

Therefore, it is likely that the decision on stopping construction of the AES in Krasnodar is not the end, but the beginning of the great work that still remains to be done. After, all the arguments so far have not even gone beyond the bounds of offices.

Do the residents of Krasnodar know that the shortage of electric power in the Northern Caucasus will by the year 2000 be over 8 million kilowatts? Do they know about the supplementary safety measures that have been worked out for AES by specialists and MAGATE [International Atomic Energy Agency] since Chernobyl (not only worked out, but already being introduced at all the plants)? Do they know that precise adherence to these measures eliminates any random chance?

It is unlikely. The information gleaned from SOVETS-KAYA KUBAN is too one-sided. The kray directors only had the word: "We do not want the AES!" On the construction of which, incidentally, 25 million had already been spent. Who will take the responsibility for this? There is one hope: the site will be used.

The citizens of the Kuban, however, have not so far been issued the final decisions. Today they do not even know if they have a choice.

Theoretically, they do. Instead of one AES or GRES in Krasnodar Kray, 20 GES can be constructed. Or 1000 "wind turbines." Or 100,000 solar batteries. There is even a plan to locate the AES close to the shore area on floating platforms. Or to concentrate all the country's atomic power between the 58th-60th parallels—natural cooling, abundance of water, a thinly populated locality.... A practical solution to the problem of superconductivity, which makes power transmission over great distances economically expedient in the near future, is approaching. What, then, are the Krasnodar citizens to choose?

Now they want to construct a GRES here: it is customary, much-tested and, the main thing, without serious consequences....

It remains to be hoped that this time the decision made will actually be the optimal one. This must be explained to the people—with every calculation in hand. Because, really, the decision made is taken on trust, today, and tomorrow can also arouse doubt in someone. Because this is the way our century is—an ordinary iron, if not turned off in time, can become the cause of great calamities. And the subject is by no means just an iron....

"A GRES, of course, is not a panacea," feels Vladimir Fedorovich Galich, head engineer of the Division of Radioactive Contamination Monitoring of the State Committee on Hydrometeorology and Environmental Control. "Those same Krasnodar citizens can be shown letters from Ekibastuz, from KATEK—during the season, pasturing sheep wear down their teeth, mothers cannot dry their infant's diapers outdoors—they turn

yellow from the acidic emissions, everything is covered with a layer of ash. The nuclear plants, however, under normal conditions are ecologically almost harmless.

All this must be known—and not only this.

What does each one of us, non-specialists, remember (even on the secondary school level) simply about nuclear power? Indeed, what about non-specialists, if many Chernobyl professionals, in the first few days after the accident, sometimes did not know how to behave: they had to make others adhere to safety measures.

Get together today 10 senior classmen and ask: who will go to work at an AES? Perhaps one will agree, and his parents will talk him out of it. We are afraid so. In France, for example, school children go on excursions to AES. And after the Chernobyl accident, the 17-year-old son of a shift chief at a plant said to his father: "After everything that I have seen and heard, I will go into nuclear power engineering." He knows, and therefore he is not afraid.

They say: "After Chernobyl...." But it is really clear, even to a non-specialist: Chernobyl is by no means a tragedy of technical progress. Indeed, can there be a tragedy in progress? The tragedy is irresponsibility, lack of system and simple ignorance.

It is time to turn the conversation to that—to the state of our literacy, not only the moral, but also, so to speak, the "educational", readiness to discuss ways to develop technical progress, and to the fact that not only the plan for a nuclear plant, but any large plan which can have a global influence on the environment (let us recall the bend in the rivers or Kara-Bogaz) must be studied and discussed—widely, in a democratic way, but correctly and argumentatively.

Only in this way can the "chain reaction," which, after the arguments concerning what happened at the Krasnodar AES, atomic workers fear (and not without foundation), be stopped.

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### **Black Market Trade in Nuclear Fuel**

51000002 Moscow IZVESTIYA in Russian  
6 Feb 88 p 6

[Article prepared by S. Guk: "Nuclear Raw Material on the Black Market: How the International Underground Syndicate Avoids the Existing Bans"; first paragraph is IZVESTIYA introduction]

[Text] The West German daily ZEIT published extensive documentation on "Nuclear Corruption on a World Scale," showing how Western firms dealing with nuclear raw material, like drug dealers, are using secret channels through which fissionable materials leak into the Third

World countries. The business, which yields enormous profits, threatens uncontrolled distribution of nuclear weapons. We are publishing brief excerpts.

The bans established by the International Atomic Energy Agency (IAEA) represent, in the words of a former official of it, a net with large mesh: "Sharks get tangled in it, but piranhas pass freely through it."

In 1975 the FRG concluded an agreement with Brazil on deliveries of reactors and systems to enrich nuclear raw material. Such technology, designed for peaceful use of nuclear power, is without a doubt also suitable for military purposes.

In the Western countries, fissionable materials are subject to rigid international and national control. Smart operators from underground business, however, have found loopholes even here. A. Rosnagel from the FRG, a specialist on atomic energy and a lawyer, in his recently published book, "Using Nuclear Power for Non-Peaceful Purposes," showed how raw material, each gram of which, one would think, is most strictly accounted for, can be involved in thefts.

The inspectors visit the enterprises where the fissionable materials are stored at least once every six months. They check the expense book and inspect the remainders. The measuring apparatus, however, is imperfect: it gives "permissible" discrepancies of up to 1.5 percent of the existing reserves. A firm having, for example, 2,500 kilograms of plutonium oxide, after the routine inspection can fearlessly set aside up to 30 kilograms of "uncounted" raw material. Some 17.5 kilograms are enough to manufacture one atomic bomb.

According to the estimates of American scientists, in the United States alone, from 1945 to 1978, over four tons of highly-enriched uranium and plutonium disappeared—an amount sufficient to manufacture hundreds of atomic bombs.

In order to sell the "uncounted" nuclear raw material on the international market, it must be hidden and then taken out of the country. In the unanimous opinion of experts, nuclear waste storage sites are ideal for concealment: the inspection authorities trace only the "circulation" made by the nuclear raw material and have absolutely no interest in the wastes. The recent scandal connected with the secret dealings in nuclear raw material, into which the West German firms Nukem and Transnuclear proved to have been drawn (IZVESTIYA reported this—S.G.)—is graphic confirmation of this. Hundreds of the drums used to transport nuclear wastes can be carried across the border without any particular problem. It is enough to fill out, as necessary, the documents, in which the load will be inaccurately designated, or something different will be indicated on it: the authorities inspect the invoices, and not the contents of the drums.

Companies specializing in illegal transports of nuclear raw material have long been in operation, not only in the FRG, but also in the United States, South America, Japan and Australia. The Third World countries, wishing to obtain fissionable materials to create their own atomic bombs, can do this without any particular trouble. It is enough to resort to the services of the black market, where the Mafia of the international "atom" dealers rules. Illegal trade in enriched fissionable materials is growing in parallel with the construction of units to enrich and reduce nuclear raw material in the developed Western countries.

12151

### **Windscale Reactor Accident Discussed**

*51000001a Moscow PRAVDA in Russian 15 Feb 88 p 7*

[Article by A. Lyutyy, PRAVDA special correspondent: "Alongside the Nuclear Devil: What Happened at Windscale in October 1957 Has Long Been Cloaked in Secrecy"; first paragraph is PRAVDA introduction; last two paragraphs are TASS report of 14 Feb 88]

[Text] After putting on a safety helmet made of orange plastic and being taken up in a special elevator, cautiously, carefully, we step onto the roof of a gigantic cube, almost 30 meters high. The roof is made of extremely strong concrete, three meters thick. Here and there, heavy round plugs made of cast iron have been entrenched in it. These are air-tight valves, and by opening them scientists, by means of remote-control manipulators, check the state of the "patient" within.

The "patient" is a still unquieted atom. Just a little over thirty years ago, human error brought it out of its obedient state. It was incited to rebellion, showing its terrible force. That was a fire in reactor No. 1 of the Windscale nuclear complex in northwest England. The fire was then successfully extinguished and the atom was contained in the concrete sarcophagus of the reactor, but the consequences of the tragedy proved so great that more than one decade will still be spent in eliminating them.

Even then, Windscale posed the question: is man capable of being intelligently in charge of nuclear power? The question was not posed by chance. After all, reactor No. 1 was in operation during the war, producing plutonium for Great Britain's nuclear weapons.

On the roof of the reactor that was damped down soon after the fire thirty years ago, the English escorts try to show, in every way, and even with a certain deliberate efficiency: the tragedy was long ago, there is nothing more to fear, and the nuclear fuel remaining in the cube will in time be safely removed. There are no particular grounds for trusting them—we were not even provided with radiac instruments. All the same, we were somewhat reminded of the unseen killer called "radiation." Approaching the edge of the roof, we saw below, next to

the hermetically sealed entrance to one of the pipes along which air had once been fed to the reactor, someone's rubber boots and clothing. Our escorts explained: with a view to safety, the workers performing the cleaning operations in the air outlets leave their special overalls and footwear in the reactor area, dressing in clean garments before they leave.

Having come down from the roof, we looked around outside Windscale Reactor No. 1 and the nearby Reactor No. 2, with the same design, which had also been damped down thirty years ago. Next to the reactors were two identical 130-meter pipes made of concrete, their shape reminding one of an aircraft dispatcher tower. Once, jets of air, cooling the graphite core of the reactors, had been ejected along them into the atmosphere.

Strictly speaking, our visit to the nuclear complex, which is now called Sellafield, was to a certain extent also historical. For the first time, the English authorities permitted Soviet journalists not only to visit the area of the complex, but also to look at Windscale Reactor No. 1.

Windscale. For many Englishmen this word has been shrouded in a cloak of secrecy, and has subconsciously summoned up alarm. What took place here in October 1957 engendered a mass of questions, guesses and even legends, more than once splashed across the pages of newspapers and books and on television and movie screens. In its time the movie "The Medusa Touch," featuring Richard Burton and Lino Ventura, was hushed up. The film told of the supernatural powers of a former scientist, played by Burton. By tensing up his brain, he could, with beams of mental energy, bring down passenger planes, set fire to motor vehicles and destroy churches and temples. At the end of the film, finding himself in critical condition in a hospital, the hero explains the reason for his mysterious abilities, by writing out on a sheet of paper, painstakingly, with a trembling hand, just one word—Windscale.

This, however, is mysticism. Here is what really happened. 1945. Nuclear bombing of Hiroshima and Nagasaki. Washington lets a nuclear genie out of a bottle. In London, meanwhile, they make no attempt to make their American allies listen to reason. On the contrary, they decide to enter into the nuclear race as quickly as possible. As early as December 1945 the government of Prime Minister Attlee made the decision on accelerated construction of plutonium production capacities. As if scoffing at concepts of beauty, they select for this a site in a picturesque corner of the county of Cumbria, seven miles from the Scottish border. In the course of three years—from 1947 to 1950—a reactor to process uranium into plutonium is constructed at rapid rates. This unit is called Windscale Reactor No. 1. A few months later, an analogous No. 2 reactor is put into operation. Both are put into service for a military-industrial complex.

Windscale reactors Nos. 1 and 2 were among the first such units in the entire world. There was much that was unknown and untested, and individual malfunctions and errors seemed to be inevitable. There might not have been any, however, if such a furious pace had not been assigned for plutonium production. The former head of the British Atomic Energy Authority, Mark Baker, recently acknowledged that at the initial stage of operation of the Windscale reactors, "they cut corners on questions of safety in a way that would be simply inadmissible today." Warnings about the impending calamity, directed even to the head of the government, were ignored. The tragedy was essentially inevitable, and it happened.

On 8 October 1957 the temperature in reactor No. 1 rose sharply. The operators lost their heads—they could not control the process. The grid overheated and the fuel began to flow out and burn. Clouds of radioactive smoke poured out of the reactor pipes. The contamination of the site began.

According to just the official documents, the plant workers received a dose of radioactive irradiation 150 times that of the permissible norm. Radioactivity in nearby areas exceeded the safe level by a factor of 10. The radiation cloud hung not only over the northern part of England and Scotland, but also over a considerable part of Northern Europe. Only two days after the start of the fire did the government circulate a disgracefully short report, from which it followed that no "evidence...of any danger to people" had been detected. It was affirmed that the radioactive cloud "posed no threat and in any case had already been dispersed by wind over the sea." This was a lie, if only because for a radius of 200 miles around the complex the consumption of milk had quietly been forbidden. The contents of thousands of milk cans were dumped into underground wells and into the sea. Only on the fourth day, on 12 October, was the fire in reactor No. 1 successfully extinguished. In the opinion of specialists, Windscale was very lucky: the reactor did not explode, which would have entailed a catastrophe on an immeasurably large scale.

To this day about 17 tons of partially burned or molten nuclear fuel lie on the bottom of the reactor. Several more tons are trapped in the ducts of the air blow-throughs and in the waterways. Their openings connecting with the combustion chamber were walled up with concrete. It is thought that the reactor, insulated from the atmosphere, poses no threat. All the same, although the radioactivity of what is left in its womb constitutes, in the evaluations of specialists, only one hundredth of what it was at the time of the fire, it is difficult to predict the behavior of the "prisoner." For three decades, it has been cautiously approached as fuel. Only in the next few years will the cleaning-up operations begin.

Specialists assume that, with respect to the scale and extent of radioactive contamination, the accident at Windscale is second only to Chernobyl. At that time, in

1957, no one was killed, neither at the control board of the reactor, nor in the area adjacent to it. Several years later, the count of victims began. The first was a little boy from a local village, Simon Boyd, who died in 1960 of an acute form of leukemia. According to the data of the National Council of Radiological Protection, the number of those who died from radioactive irradiation has reached 33 persons today. The plant workers deny that the Windscale fire is to blame for this. However, when we asked Jim Jones, an engineer of the Atomic Energy Authority, to comment on the data of the council, the response was significant: "We are in no position to prove that it was not the accident that caused their death."

Here are a few words on the political aspect of the Windscale incident. At the beginning of this year, in connection with the expiration of the limitation period, the government archives for 1957 were declassified. Among them were documents pertaining to the actions of the cabinet of Prime Minister Macmillan. Immediately after the accident it was revealed that in order to save its own political face and "special relations" with the United States, the government at that time concealed the true scale of the tragedy. For example, Macmillan personally censored the report of a special commission on the causes and consequences of the accident, and the ministers were ordered to hold their tongues. "It is simply shameful that the government did not trust its own people," declared Robin Cook, a Labor Member of Parliament, on this subject.

The succeeding governments did not trust their own people either. Even the conservative press notes with irony that the Soviet Union took only a few days to tell the truth about the accident at Chernobyl, but it took the British government a whole thirty years. Indeed, has the whole truth been told? After all, part of the documents were not even made public.

It was revealed that Macmillan's actions were based on the attempt to reduce to the minimum the criticism within the country. The Prime Minister was afraid that if all the circumstances of the incident were made public, and if the malfunctions, errors and incompetence of the service personnel at Windscale were told, Washington might regard this as a divulgence of nuclear secrets and refuse to share such things with London—which was very necessary. After all, at that time the English hydrogen bomb was being developed.

Today the Sellafield complex (it includes, along with the two idle Windscale reactors, a chain of operating reactors for gas-cooling of Calder-Hall) is filling the orders of the War Department. Located quite close to it are naval shipyards, where British nuclear submarines are produced.

It would be incorrect, however, to say that the functions of Sellafield today are wholly subordinated to military interests. The complex also benefits the people from a

practical standpoint. The Calder-Hall reactors mentioned, put into operation in 1956, provide electric power to the county of Cumbria. Chemists, physicists and metallurgists are seeking ways to use nuclear power in various spheres of modern production. We went through these clean laboratories, filled with bright, modern equipment. In one of them we were shown mechanical manipulators, by means of which the wastes in Windscale reactor No. 1 will be purified. A special robot has been acquired for this purpose. Work will begin as early as this year. It may go on to the end of this century.

This is what Vernon Eldred, one of the leading figures of British nuclear power engineering and director of the Windscale Nuclear Laboratory, said (the laboratory's task includes preparing work on cleaning the suppressed reactor and a number of research investigations):

"Chernobyl was a terrible event for all of us, but at the same time it showed the amazing boldness of your people. From the standpoint of organization, the work to overcome the accident was performed very well. The whole world is also grateful to the USSR because you made known the necessary facts and presented them to MAGATE [International Atomic Energy Agency] quite quickly. You, of course derived a great deal for yourselves from this tragedy. It was in our common interests to act so that this sort of thing would not be repeated. Nuclear power safety must be increased."

Inevitably, the conversation turned on the fate of this sector.

"When the accident happened to you in Chernobyl," said V. Eldred, "we here, in Sellafield, were literally bombarded with telephone calls. After all, up until then we were the only plant in the world where there had been a fire in a reactor. Let's face it—Chernobyl was not good publicity for nuclear power engineering."

Eldred was right in his own way. But it is hardly Chernobyl alone that is to blame for the difficulties that British nuclear power engineering is now experiencing. These difficulties were to quite some extent intensified by Windscale and the discovery of the truth about the circumstances of the 1957 tragedy. Now, in many cities in England one can see demonstrations by members of the Greenpeace organization and other associations speaking out for the dismantling of nuclear power plants.

"Mankind," thinks V. Eldred, "has no other course but to continue to use nuclear power. As before, this is the cheapest method of obtaining electric power. In addition, even despite the incidents known, it is still the safest. Reserves of coal and oil are not unlimited. Some

countries are obtaining more than half of their electric power at nuclear electric power plants. In France, for example, this proportion is even 76 percent. I am against wholesale demands to shut down nuclear electric power plants. I am for, in sensible proportions, combining the use of nuclear power with the use of other types of energy. Society's alarm is understandable. Therefore, the task of specialists is to sharply raise the level of safety and to make nuclear reactors practically 100 percent reliable."

Sellafield is located in a fantastically beautiful place—on the shore of the Irish Sea, severe in its cold majesty. The complex stands in a depression, surrounded on various sides by low mountains. The plant represents a combination of the artificial, still not completely comprehended, with the natural, given to us by the land itself.

This is the way it is for nuclear power engineering. Many of us, when turning on the television, the radio, a lamp, sometimes do not think about the fact that the atom with its majesty helps us to enjoy these conveniences. When, however, we learn about Chernobyl or Sellafield, the atom represents a monster that will destroy us if we do not destroy it. It would seem that the answer to the question: can the atom exist with man?—lies in the people themselves.

#### When the Number Was Up....

London, 14 Feb 88—(TASS)—Only minutes separated the British nuclear submarine Resolution, with Polaris missiles on board, from a catastrophe, the scale of which is difficult to imagine, reports today's OBSERVER. The Resolution is one of the oldest ships of this class—it was in the docks of the navy base in the Bay of Faslane (Scotland), when the nuclear reactor cooling system unexpectedly failed. As a result, the reactor housing began to heat up precipitously, threatening to cause an explosion with powerful radiation emission. Only due to the prompt actions of two mechanics, who were able to switch on the emergency cooling system rapidly, was it possible to put the reactor operation under control. As the OBSERVER reports, this dangerous incident took place last month, and the 13,000-population of the adjacent areas were not even notified of the threat of catastrophe. Today the Resolution has again gone to sea for "duty patrol."

According to the testimony of experts, the explosion of the submarine's nuclear reactor could cause fatally dangerous contamination in an area of up to 2,000 square miles.

## BELGIUM

### Questions Remain Open In Mol Nuclear Scandal 51002447 Brussels LE VIF/L'EXPRESS in French 25-31 Mar 88 pp 24-26

[Article by Michel Balthasart]

[Text] What does the boycott of the European Parliament's investigating committee by the Belgian Government mean? That any discussion of the "hidden face" of the nuclear industry should be avoided? LE VIF/L'EXPRESS will reopen the issue as often as necessary.

"The waste products have disappeared? So what? Is it not the objective of the processing center to make waste products disappear?" These "good words" from Norbert Van de Voorde, former director of the Waste Department at the Mol Nuclear Power Center [CEN], did not bring a smile to the members of the European Parliament's committee investigating the "Transnuklear" affair. The latter have nothing but harsh words to describe the attitude of the Belgian Government which has purely and simply decided to boycott the committee. As a matter of fact, very precise instructions to this effect were given to the departments involved. "That means that there is indeed something to hide in this affair," stated Anne-Marie Lizin, a socialist member of the European Parliament, protesting the absence of the CVP [Flemish Christian Socialist Party of Belgium] member of parliament on the committee during the interview with Van de Voorde.

The "Transnuklear" affair has undoubtedly gotten "stuck." In the FRG, eight individuals have been indicted. The leaders of the Hanau and the Nukem plants have resigned. One of them committed suicide in prison. Moreover, the Bonn government has decided to close the Nukem plant and a decision was also made to dissolve Transnuklear.

None of that has happened in Belgium: no indictments, no resignation at the top of CEN, no closing measures. It is true that Van de Voorde was dismissed, but it is harder and harder to understand on what grounds, because his protestations of innocence are not countered by any specific legal accusation. His assistant, who was also dismissed for corruption, had to be reinstated and is still working at Mol.

The investigations are at a standstill: the High Supervisory Committee was refused permission to interrogate the main witnesses; the searches were carried out late; and the most persistent rumors continue to circulate on the "protection" enjoyed by certain individuals involved in the affair. The Nuclear Security Service—which is currently pursuing its investigation—has turned in reports to the Ministry of Justice which have not been made public. Firmin Aerts, secretary of state for energy, has been made aware of some of the conclusions reached by the High Supervisory Committee, but he is keeping

them to himself. Questions such as the one concerning the frequent presence at the Doel nuclear power station of Bretag, Transnuklear's henchman, were not examined. In such a context, the boycotting of the European investigating committee by the Belgian Government takes on a particular significance. The "CEN-Transnuklear" issue really seems to have been "locked up."

And yet, this bad serial, which undermines the international reputation of Belgium and worries the electricity producers, has not come to an end. Indeed, every day new information comes out to confirm the serious "mistakes" found in the management of the Mol power station. "Mistakes" which the lack of developments makes it impossible to trivialize.

While continuing to turn the affair into a "community" issue, to talk of a "plot" led by the "cowboys" of the IRE [Institute of Radioelements], the Mol union members are adding their stone to the structure of accusations. According to them, "a series of questions relative to personnel security and to the techniques used at Mol had already been raised in 1984." In fact, they said, the "waste product" service was regularly taken advantage of by CEN and the general management limited itself to recording the profits without carrying out too much control. Still in terms of controls, Michel Bemong (a Christian trade unionist) noted that at Mol a metal detector was supposed to prevent materials from leaving CEN, but that visitors were not submitted to it!

The absence of rigor, the receptiveness to corruption, the disorganization of the services, the lack of resources: all the elements which formed a "favorable background" for the development of the Transnuklear affair in Belgium are still there. They can be found in all the private sectors of the nuclear industry. As soon as the notions of "trade" and "competition" appear, slippage is possible. This is true in the—little known—sector of the nuclear medical industry.

Several private transportation companies occupy this sector: Eufrex, Securicor, Chartier, Van Osselaer, etc. Some of the products they transport from producers (IRE, in Fleurus; the Amercham, Techland companies, etcetera) to users (hospitals, doctors, etc) are not very dangerous. But others are more delicate. Among the latter: "generators," in the form of special packaging surrounding a leadcontainer holding radioactive substances (iodine 123 and assimilated products).

In Belgium, the least radioactive product, no matter what its life expectancy may be, is subject to specific regulations. It must be registered, followed without interruption, and every intermediary must fill out detailed forms which are under the control of the Ministry of Public Health.

But those precautions, those regulations do not at all prevent the existence of some "abnormalities." In principle, when a driver delivers a generator to a hospital he

must get a signed receipt. In practice, some receiving services refuse to accept products bearing the nuclear insignia and send the delivery person to the relevant departments. "If the latter are closed," explained a member of a transportation company, "it often happens that the receipt is not signed or that it is signed by the driver. Conclusion: generators are regularly abandoned in hallways, with no particular supervision."

Such practices are caused by trade imperatives. Competition in the market of substance transportation is tough. As a matter of fact, the establishment by IRE of its own company ("Transrad"), linked to the Depaire transportation company (80 percent SNCB), has begun to cause a great deal of commotion. In such a context, the temptation to "break" prices by any means, and thus to take risks, is very great. Some people are already talking about the possibility of "pirate" transportation carried out with sub-contracts by non-accredited firms.

In fact, all the elements of a "favorable terrain" for the development of a new problem are once again present. All the more so as the relevant agency of the Public Health Service is short on personnel.

Security requirements in nuclear matters have evolved and the structure of administrations has not been adapted. Today, generators must be transported in armored vehicles, protective shields must be installed behind the driver's seat, etc. Twenty years ago, it happened that plutonium—an extremely delicate product!—was taken from the site of Eurochemic in Dessel to the Federal Republic of Germany in a simple Citroen ID belonging to Transnuklear. Special containers (bird cages) capable of holding 4 kilograms of plutonium were installed above the gasoline tank! Such incredible things would, of course, no longer be allowed today.

Van de Voorde himself also complained about the logistics: "In 1982," he told members of the European Parliament, "we asked for subsidies to set up a really operational installation. But we did not get anything. We were a small department suffering from a lack of personnel and money." In fact, everything is happening as if people were only now beginning to measure the real cost of the nuclear "magic." Will the addition, when it is done correctly, really be bearable?

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## FRANCE

### Nuclear Fuel Cycle Industry at End of 1987

81192813 Paris REVUE GENERALE NUCLEAIRE in French Jan-Feb 88 pp 48-50

[Article by M. Barron, assigned to the Cogema General Directorate: "French Nuclear Fuel Cycle Industry at End of 1987"]

[Text] The author notes the satisfactory operation of fuel cycle installations in 1987, emphasizes the high level of

exports in this field, and points out the large investments made to create or expand factories and plants. He also mentions the programs undertaken to recycle uranium and plutonium.

An article published in the September-October 1986 issue of REVUE GENERALE NUCLEAIRE gave a general description of the French nuclear fuel industry.

In its essential aspects, the general structure of this industry has not undergone significant changes since then.

The situation of the nuclear fuel market in which it operates remains relatively difficult. The worldwide nuclear program slowdown that began several years ago, continues, and the Chernobyl plant accident of May 1986 contributes to this situation.

The uranium market remains depressed and production volume has not increased. This volume is still slightly lower than consumption, which eventually could lead to stock reductions and better market balance.

Today, the nuclear fuel industry is characterized by several major features.

### I. Satisfactory Installation Operation

In the area of natural uranium production, mines and ore processing plants have operated satisfactorily.

The Cogema group, which since 1986 includes the Compagnie Francaise de MOKTA, produced 7,600 tons of uranium concentrate in 1987, of which 2,800 tons in France and 4,800 tons abroad.

At the same time, Total Compagnie Miniere (TCM) produced 550 tons in its Nord Massif Central and Sud Massif Central divisions, and marketed 870 tons.

Overall, this represents more than 20 percent of the world's production.

Given the situation of the natural uranium market, productivity efforts have been made to reduce production costs. In the past, Cogema had built some improvements and installations, and these are now bearing fruit. In turn, TCM-France has taken technical measures which considerably reduced ore processing costs at its Berthelene mining division.

The two companies also continued their prospecting operations, but reoriented them toward regions that are most promising and close to current exploitations. In particular, Cogema acquired a significant position in Canada through its Cogema-Canada subsidiary.

The fabrication of fuels for pressurized water reactors is carried out by Societe Franco-Belge de Fabrication de Combustibles (50 percent Uranium Pechiney, 25 percent

Framatome, and 25 percent Cogema), which has three plants, the most recent of which is located at the Pierrelatte site, and was completed in 1987. With a production capability of 1,500 tons per year, this installation is in a foremost position in the world.

The operation of the La Hague and Marcoule reprocessing plants has been very satisfactory. During March 1987, these two plants exceeded their nominal monthly production levels, for light water fuels at La Hague, and for operating the MAR 400 unit at Marcoule.

The 2000th ton of used fuel from ordinary water reactors was reprocessed at the La Hague plant on 6 November 1987. Processing of this type of fuels began in 1976, and the cumulative figure reached 1,000 tons 38 months later. The next 1,000 tons required only 22 months.

These results are part of a steady progress in installation performance, and have been achieved under perfect conditions of safety and respect for the environment.

Production at the Eurodif uranium enrichment plant was slightly higher in 1986 to reach a level close to its normal capacity. It has operated under good conditions thanks to a design based on an industrial process which is essentially static except for its compressors, and which is therefore highly reliable. Scheduled deliveries were made to customers' satisfaction.

The same is true for the Pierrelatte high enrichment isotopic separation plant, which has operated with remarkable consistency and has fulfilled its established production programs.

In May 1987, in the presence of its French and foreign customers, Comurhex celebrated the delivery of its 100,000th ton of uranium, which amounts to 4 billion tons of petroleum equivalent, representing 13 years of Saudi oil production.

## II. Maintaining High Exportation Level

In 1986, 43 percent of the Cogema group's revenues, amounting to more than Fr9 billion, were derived from exportations. The greatest share of the exports, for 51 percent of the company's revenues, came from enrichment.

Although the 1987 results are not yet known, they will undoubtedly be similar to those of 1986.

In order to penetrate the American market, Cogema, Framatome, and Uranium Pechiney recently reached an agreement with Babcock and Wilcox to manufacture fuel assemblies in the United States. The objective of this joint business, the Babcock and Wilcox Fuel Company, will be to fabricate fuel elements for pressurized water reactors and to sell in the United States and Canada fuel assemblies and associated services.

This agreement will also provide access to the American market for the facilities installed to carry out the French program for nuclear power generation. It includes the creation of a unit installed in the United States, 51 percent of whose capital will be held by Babcock and Wilcox, and 49 percent by a company composed of Cogema's and Framatome's American subsidiaries, each of which will hold 40 percent, and of Uranium Pechiney's subsidiary, which will hold 20 percent.

In engineering, SGN and Cogema Inc, Cogema's American subsidiary, created Numatec Inc to develop their end-cycle activities in the United States.

The know-how acquired by Cogema's engineering companies in the design and construction of reprocessing plants, places them in a favorable position. That is why Japan chose to rely on French knowledge to design a reprocessing plant with a capacity of 800 tons per year, which will be located at Rokkasho-Mura in the north of Japan. Agreements were signed on 30 April 1987 by Societe Generale Pour les Techniques Nouvelles, acting for AEC and Cogema and on its own behalf, with the Japanese company JNFS, for the technology transfer contract, and with Mitsubishi Heavy Industries and SGN for engineering. The transfer agreement covers primarily the fuel chop-and-leach and dissolution technology, and the technique for uranium and plutonium separation. It amounts to 28 million yen, or Fr1.2 billion.

The engineering contract signed by Mitsubishi Heavy Industries and SGN covers a basic design study; it amounts to 12 billion yen, or Fr516 million. It will probably be followed by a detailed project study plan, and subsequently by support extended to the Japanese companies during the construction and start-up phases.

It should be noted that in the past, Japan has signed a large number of contracts in the nuclear fuel area, from which Cogema derives Fr2 billion per year. The Japanese have in fact already relied on French industry, as SGN did in order to build a small reprocessing plant at Tokai-mura. Lastly, in the area of computer-aided production, SGN has signed a contract with China National Building Material and Equipment Import and Export Corp., which for SGN is a "first" in China, and which represents the fruits of its diversification policy in exportation.

Under the guidance of the industrial leader Uranium Pechiney, the group's companies signed several agreements in 1987 as part of the European program for developing a prototype reactor for controlled thermonuclear fusion.

In addition, CERCA has completed the first 45 percent-enriched uranium core for JAERI's JJR2 Japanese research reactor.



Lastly, 55,000 of the 105,000 tons of UF<sub>6</sub> delivered by Comurhex between 1969 and the end of 1987 were for exportation, and 16 different countries representing 30 percent of the world market are its customers.

### III. Large Investments

As we know, between 1973 and 1982 France built the Eurodif isotopic separation plant in cooperation with several foreign countries, most of them European, for a total investment of Fr23.8 billion; the construction was carried out by Ussi (now Ussi Ingenierie) as prime contractor.

In 1986, with the expanded capabilities of the La Hague reprocessing plant, Cogema had the world's largest operations. This capability, which is currently 400 tons of light water fuel per year, will be increased to 1,200 tons in 1989 and to 1,600 tons in 1992. At its completion, this program will have spread over 15 years, representing an investment of the order of Fr50 billion current. The following figures will give an indication of the installation's magnitude:

Earth moving	5,000,000 m <sup>3</sup>
Concrete volume	1,000,000 m <sup>3</sup>
Length of stainless steel piping	1000 km
Number of computers	25
Number of work hours at the site	56,000,000
Number of engineering hours	25,000,000

A considerable innovation effort has been accomplished compared to the present plant. Significant technological breakthroughs have been implemented in order to achieve ambitious productivity objectives, while respecting high safety standards. These breakthroughs have been primarily in processes, preventive maintenance, personnel protection, as well as monitoring and control.

In the area of computerization, the La Hague plant was equipped with an integrated management and information distribution system, the Haguenet network, which was inaugurated on 19 January 1988. This is currently the largest network in Europe.

Progress at the end of November 1987 can be illustrated by the following figures:

Cumulative commitments	Fr32.5 billion
Cumulative disbursements	Fr26.2 billion

Wanting to retain its leading position in the profession, this year Comurhex started an investment program which will allow it to deliver up to 14,000 tons of U per

year as UF<sub>6</sub>. This work essentially covers the purification installations at the Malvesi plant, one of the key fabrication steps, since it brings the uranium to the required purity.

This additional 20 percent capacity will shortly give Comurhex all the flexibility and efficiency it needs to face a growing international market that is still very demanding in terms of schedules and services.

### IV. A Program of Current Interest: Uranium and Plutonium Recycling

The reprocessing of used fuel from pressurized water reactors makes it possible to dispose of plutonium and uranium that is still slightly enriched but which has not been consumed. Plutonium represents about one percent of the reprocessed material; as we know, this is a fissile element just as uranium 235, and its qualities make it a fuel of choice for breeder reactors, which until recently had digested almost all the available material.

But in coming years, the construction of new reprocessing capabilities will produce an increasing quantity of plutonium, whose cumulated amount is estimated at 100 tons in 1995 and 200 tons in the year 2000.

At the same time, a slowdown in breeder reactor programs will reduce the amount of Pu that we can expect to provide, which is now estimated at a maximum of about 35 tons.

This plutonium can be used in fuel assemblies for light water reactors, where it will replace uranium 235 to form MOX fuels. Many studies on this type of fuel have been conducted since 1950, and during the 1960's many experiments were carried out in various European countries, in France among others.

Given the encouraging results and considering the know-how acquired in fabricating breeder reactor fuels based on mixed oxides, EDF decided in 1985, following a thorough study, to recycle in light water reactors the plutonium available after meeting breeder reactor needs. Beginning in 1987, the program includes loading a ninth of the B1 reactor core at the Saint-Laurent-des-Eaux plant, authorized on 13 October 1987 and started on 9 November. This operation will be repeated in 1988. Between 1989 and 1993, four to six loads per year will be inserted in the 900 MW reactors of the contract program. After 1993, the opening of a manufacturing plant named MELOX will lead to the marketing of 10 to 15 reloads per year, and to gradually provide MOX fuels for the water reactors of foreign customers.

This plant will complete the industrial facilities already built to recycle reprocessed uranium at the Pierrelatte unit and at Comurhex's Pierrelatte plant.

We might point out that the corresponding commercial structures had already been built with the Commax GIE (economic interest group) for selling MOX fuel rods, and the Urep GIE (Cogema-Comurhex) for marketing chemical transformation services for reprocessed uranium.

The French nuclear fuel industry was thus able to adapt to a market stamped by the slowdown in nuclear power generation programs.

The situation upstream in the cycle has caused it to take appropriate measures, while remaining prepared for the future. On the other hand, the cycle's downstream stages made room for interesting developments, both in fuel recycling and in reprocessing, where significant investments are underway.

It has also demonstrated great vitality, and its experience places it at the international level in a position verified by the success it has encountered in exportation.

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## TURKEY

**Argentina To Help Acquire 'Nuclear Technology'**  
*NC3105081488 Istanbul HURRIYET in Turkish*  
25 May 88 pp 3, 15

[Atilla Atakan report: "Diplomacy With Argentina on Nuclear Technology"]

[Text] Buenos Aires, (HURRIYET)—Although the United States has come out against Turkey's sale to Pakistan of components used in the production of nuclear arms, reports say that Argentina's new Ambassador to Ankara, Adolfo Saracho, a former head of Argentina's nuclear energy commission, will try "to help Turkey acquire nuclear technology."

Argentina is very advanced in nuclear technology. Its decision to appoint Adolfo Saracho as its new ambassador to Turkey has made the U.S., USSR, and FRG diplomatic missions in Buenos Aires uneasy. They believe that Turkey's acquisition of nuclear technology would be disadvantageous. Adolfo Saracho made a significant contribution to the signing on 3 May of an agreement between Turkey and Argentina for "cooperation between the two countries in nuclear technology." The new ambassador arrived in Ankara yesterday.

Prior to his departure from Argentina, he told HURRIYET: "We would like Turkey to learn about the technology Argentina has acquired during the past 20 years. We can help Turkey build reactors and nuclear power plants in the future. Our objective is to help Turkey develop its nuclear technology, without depending on any country or bloc."

Noting that Argentina objected to any interference by the superpowers in its work in nuclear energy, Adolfo Saracho noted that Argentina made it a condition that nuclear technology be used passively and for peaceful purposes. He said: "I know that my task is difficult. Due to its proximity to countries which cooperate with Argentina, such as India, Iraq, Algeria, Romania, Yugoslavia, and Albania, Turkey is a very important country."

## UNITED KINGDOM

**Trade Unions Council Policy on Nuclear Power Told**

*51500173 London THE DAILY TELEGRAPH in English 3 May 88 p 9*

[Article by Martin Whitfield: "TUC Backs Nuclear Power With Safeguards"]

[Text] The TUC has rejected calls to phase out nuclear power after an 18-month inquiry by a review committee.

But the 50-page report by the inquiry team calls for tighter conditions for the continued operation of nuclear power stations, including a complete overhaul of waste management policy.

The study, published today, is to be sent to all unions before being debated at the TUC conference in September. It is expected to be opposed only by hard-line opponents of nuclear power, such as Mr Arthur Scargill, the president of the National Union of Mineworkers.

Mr Fred Jarvis, general secretary of the National Union of Teachers and chairman of the review body, said strict regulations had to be enforced, and he attacked the Government's plans to privatise the electricity supply industry.

"We believe that privatisation is one of a combination of circumstances that must be removed if the industry is to be allowed to go forward," he said.

The review committee called for:

- A re-examination of the economics of spent fuel reprocessing.

- Mandatory public inquiries into all nuclear accidents.

- Tighter restrictions on permitted radiation doses to workers and the public.

- Strengthening the regulation of the industry by the Health and Safety Commission.

- Better international controls.

"The potential hazards are not confined by national boundaries, so it is essential that maximum international regulation is enforced," said Mr Jarvis.

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